

september/october 2015

Quest for knowledge

# braintainment

the magazine that surprises



Can you  
create  
your  
own  
**luck?**



How  
did our  
planet  
begin?



CAN YOU GET A  
COLD IN ONE  
NOSTRIL?



DO INSECTS  
FEEL COLD?



What is the  
**perfect**  
diet?



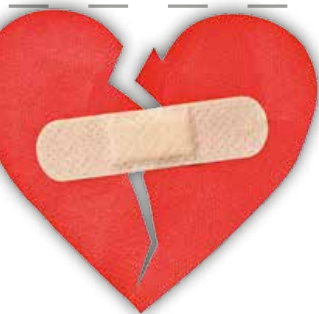
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**liqueur chocs**  
will get you  
drunk?

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attached  
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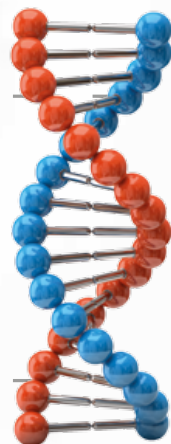
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is the  
stupidest  
experiment ever?



Who tidies up  
the internet?

What does  
**YOUR**  
**DNA**  
reveal?



What makes you an  
**intellectual** and who  
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## Why can't you hear owls fly?

**R**aptors fly much more quietly than other birds so that their prey cannot hear them coming. Also, where other raptors benefit from their speed to catch prey, the owl has to rely on his silence. Science has not quite worked out how the bird can fly so silently. There are a few clues, however. The feathers of an owl are different from those of other birds. They are longer, have a different quill structure and a smoother end. Researchers think that these properties make for quieter wing movement because the turbulence behind the wings is reduced. The feathers also contain a silk-like layer, which mutes the flapping of the wings. Lastly, the wings and feathers of an owl are more aerodynamic, allowing him to move silently through the air.





## The same, only different

In this unpredictable world, there are a few certainties. Taxes will rise, the fuel price will increase, technology will get smarter and we will continue to search for extra-terrestrial life forms. Another certainty is change. Despite the old adage that professes 'if it ain't broke, don't try to fix it', it is human nature to want to tinker with even the most successful recipe. It's all about our quest for perfection. And that is why, in November, we launch a new-look *Braintainment*. Rest assured, we will continue to provide you with informative, quirky reads on your favourite subjects, including psychology, history, tech, science, history and more. We will just be doing it in a different, more innovative way. But wait, there's more ...

To show our appreciation for your loyal readership, we are giving you the chance to read all 25 editions of *Braintainment* in this issue. How? Simply follow the instructions on page 4 and hey presto! You are good to go. But before you turn the page over, there's even more ... In this issue, we bring you more than 20 pages of questions that you, the reader, have asked over the years as well as the top feature articles that got you talking about South Africa's only popular knowledge magazine. I certainly hope that you enjoy the spread we have prepared for you and look forward to your comments about the new approach we will be adopting from November. We look forward to your comments on our social media sites, or pop a mail to braintainment@panorama.co.za. Enjoy your read.

Gerard Peter  
Editor-in-Chief



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- Why do you mend a broken heart?
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- How does a metal detector work?
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- Can you open an aeroplane door in mid-flight?
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- Why was the game of monopoly invented?





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# Who is the boss?



It seems like dinosaurs used their gargantuan teeth to lay claim to their territory

**M**ale combat first appeared some 270 million years ago. This is what researchers from the Evolutionary Studies Institute at Wits University found when they conducted an updated and more in-depth study of the herbivorous mammalian ancestor, *Tiarajudens eccentricus*, discovered 4 years ago. Through this study, researchers from Brazil and South Africa can now present a meticulous description of the skull, skeleton and dental replacement of this Brazilian species. And they learned that 270 million years ago, the interspecific combat and fighting we see between male deer today was already present in these forerunners of mammals.

Saber-teeth are known to belong to the large Permian predators' gorgonopsians (also known as saber-tooth reptiles), and to the famous saber-tooth cats from the Ice Age. Then *Tiarajudens eccentricus* was discovered and it had some surprises: despite large protruding saber-tooth canines and occluding post-canine teeth, it was a herbivore.

The discovery of this Brazilian species also allowed for a re-analysis of the South African species *Anomocephalus africanus*, discovered 10 years earlier. The two species have several similar features that clearly indicate they are closely related, but the African species lacks the saber-tooth canines of its Brazilian cousin. In the Middle Permian, where these Gondwana cousins were living, around 270 million years ago, the first communities with diverse, abundant tetrapod herbivores were evolving. In deer today, enlarged canines are used in male displays during fighting. The long canine in the herbivore *T. eccentricus* is interpreted as an indication of its use in a similar way, and is the oldest evidence where male herbivores have used their canines during fights with rivals.

## Milk from wild animals used long before domestication started

**A**n international team of researchers from South Africa, USA, UK and Italy has discovered evidence of an unusual paint mixture used approximately 49,000 years ago in northern KwaZulu-Natal. The paint mixture consisted of red powdered ochre and casein (dried milk protein) obtained from a wild bovid animal. The paint is a well-preserved micro-residue on the edge of a small stone flake excavated from Sibudu Cave by Professor Wadley from the Evolutionary Studies Institute, Wits University. Using chemical and elemental analyses the researchers were able to establish that powdered ochre was mixed with milk in its liquid form. However, the milk used was not from

a domestic cow but from the wild bovid family such as buffalo, eland, kudu and impala. This find is surprising for a number of reasons. The use of bovid milk predates the introduction of domestic cattle in South Africa. So how was the milk obtained from a wild bovid? The authors suggest that the milk was likely obtained by killing a lactating wild bovid female. Many South African wild bovids separate from the herd when giving birth and hide away with their young, thus becoming easy prey for experienced hunters, writes the team. Previous studies show that early humans blended ochre with other substances to make paint, body paint, sunscreen and glue for fixing

stone tools on wooden or bone handles. There are, however, no

ethnographic precedents for mixing ochre with milk.



This image shows Sibudu rubbed red ochre



## How does a music recognition app work?

Kyle Anthony, Johannesburg

**A** music recognition app works by comparing various spectrograms with one another. A spectrogram is a graph in which the frequency and the amplitude of the music are measured against time. This

delivers a unique pattern per song. When you present a song to the app, it will create a spectrogram and compare it to a database of millions of songs. Eventually it will send the user the title of the song.

MORGAN DAVID DE LOSSY/CORBIS/HH

## How far can you look into space with the naked eye?

Jeff Swart, Windhoek

**T**hat depends on circumstances. Normally you can see the Andromedanevel, the furthest object you can see from the Northern Hemisphere. It is between 2.4 and 2.9 million light years away from us. On a very bright night with no artificial light, and if you have very good eyes, you might see the Bode system. This spiral-shaped star system is about 12 million light years away from us. And with lots of luck you might see even further. It would have to be a supernova, an exploding star that is extremely bright at the same time. Researchers discovered a supernova at about 21 million light years with binoculars last September. If it was closer you would have been able to see it with the naked eye.

## Can you get a world record in anything?

Martin Court, Pretoria

**T**here are hardly any rules for a record attempt. The most important requirement: the record has to be breakable. You may also not risk your life or make animals suffer. Guinness World Records decides if an attempt has the right requirements. So 'draw as many suns in 1 minute' is allowed. Most records don't make it into the *Guinness World Records* book. There are only 4,000 in the book whereas there are 60,000 records. The organisation decides which ones make it into the book. The unpublished records are known by the organisation, but cannot be found. They are working on a website to put these on.

SOURCE: GUINNESS WORLD RECORDS

You don't have to be good at anything to break a record.

HENRY ROMERO/REUTERS



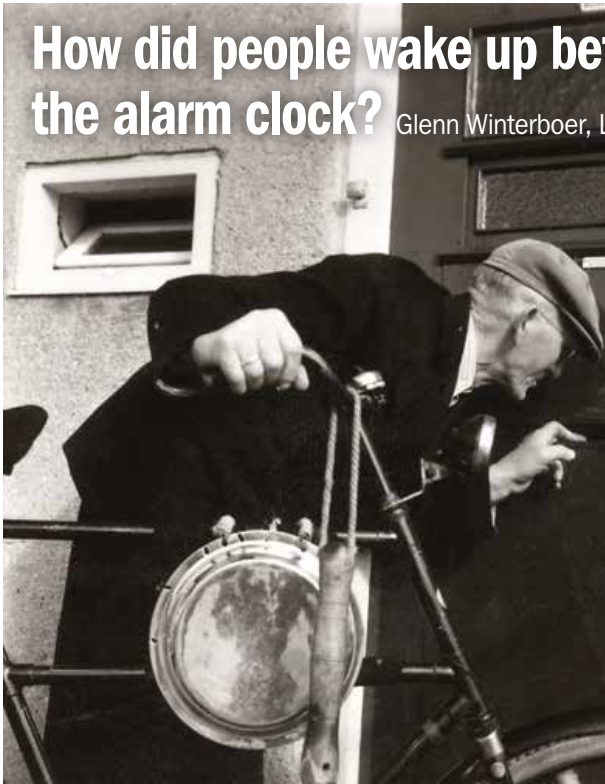


Brown looks better with the models of the '70s. Nowadays cars are mostly silver, white or black.

## How did people wake up before the alarm clock?

Glenn Winterboer, Lambton

**B**efore the invention of electricity, at the beginning of the 19th century, people had a very different rhythm. They would go to bed early because there was little to do without light. And because of this, people would wake up early, often as soon as the sun would rise. From that moment they would work. Working hours were a lot less strict than today. This all changed with the industrial revolution, when factories started to work with set hours. The first alarm clocks date from this time, but they were far too expensive for ordinary folk. A new profession developed – that of 'knocker'. People with alarm clocks woke up the workers who had to go to the factory by knocking on the door.



## Why are there so few brown cars around?

Maureen Terblanche, Bloemfontein

**T**his is a matter of fashion. Very few people like brown cars, so they weren't manufactured. Brown was fashionable in the '70s and more brown cars were around. Apparently the brown car

is making a comeback. In 2006 there were 43,080 brown cars in the Netherlands. In January 2011 this rose to 68,866. Brown beats orange (52,273) and pink (3,475).

SOURCE: CBS

## How is a snail attached to his house?

Riet Klein, Harrismith

**W**ith a strong muscle. It is attached to the central part of the house, the columella. This is the axle and the house winds itself around it. This muscle is used to pull the animal inside the shell.

### Q&A **FLASH**

- Snails have blue blood. This is because their blood does not contain haemoglobin like ours, but hemocyanine.
- A snail has razor-sharp teeth on its tongue. It can even grind rocks to get the algae out.
- A snail will use its lubricant to slide, but also to push off.





## Why do prisoners in cartoons always have a black ball chained to their leg?

Inga Swart, Sedgefield

### Q&A **FLASH**

- Until 1955, American prisoners were chained together so that they could work outdoors.
- In 1995, the so-called chain gang was introduced again for a year in a few states in the USA as an experiment.
- Currently, there is only 1 American prison where inmates can volunteer to work in a chain gang.

**T**hat's because such a ball was used in the old days to chain prisoners. The ball was extremely heavy, making escaping impossible. This method was used throughout the British Empire, mostly in African colonies, from the 17th century to the end of the 20th century. The treatment of prisoners became more humane during the 20th century. But the ball and chain are so connected to the idea

of a prisoner that cartoonists have adopted it. It is clear that we are dealing with a prisoner when the ball and chain are drawn.

**A nice black and white striped outfit goes well with the ball and chain.**



SHUTTERSTOCK

Did you know that in some areas of Europe you are not allowed to use a detector because the ground might contain ammunition from WWII?

## How does a metal detector determine the difference between stone and metal?

Jayden Denness, Durban

**F**irstly, the magnetic field of a metal detector changes because of metal and not because of stone. A metal detector usually has 2 rings, a smaller one with a larger ring around it. There is a gap of only a few centimetres between the 2 rings. This creates the detector's magnetic field. A

piece of metal in the surroundings distorts the magnetic field, thus sounding the metal detector's alarm. Some metal detectors can recognise different types of metal such as copper, gold and silver. This is possible because the various metals distort the field differently.

### Q&A **FLASH**

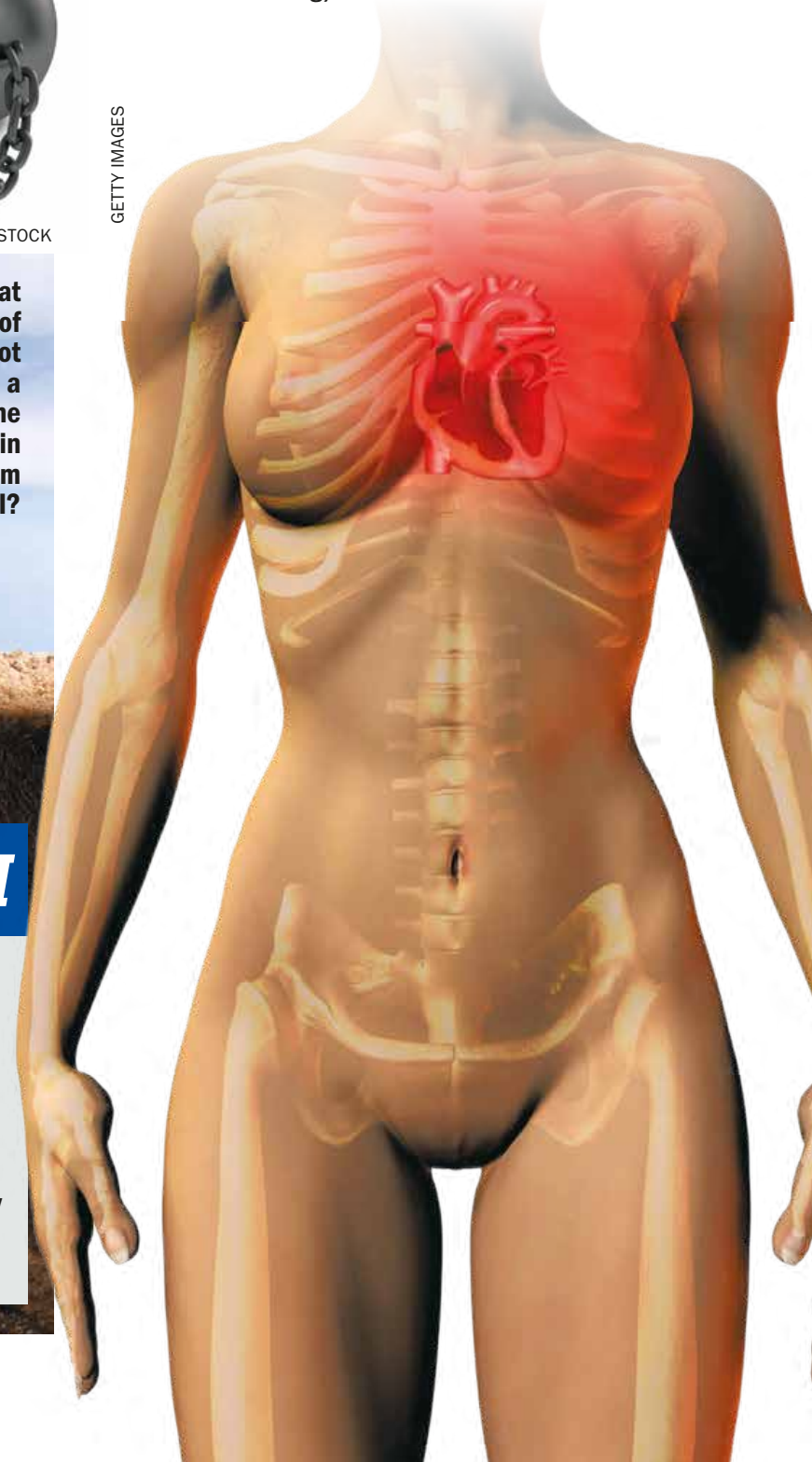
- You are not permitted to look for objects on a private property without the permission of the owner.
- You are allowed to explore most public places, except if they are marked as an archaeological site.

## Why are emotions like longing and hate felt in your chest and not in your head?

Nadia Hall, Durban

**W**hen you feel emotion in your body, then you feel how your body is getting ready to react to an emotional situation. The why and how are sometimes pretty obvious. Your body prepares for 'flight' mode when you are scared. Your heartbeat rises, your muscles tense and require more blood, and you feel those changes. But for other emotions it is less obvious why your body reacts the way it does, and also why you feel some emotions more in your tummy (a knot in your stomach) and others more in your chest (a tight or actual warm feeling).

GETTY IMAGES





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Why even pepper plants can give you hay fever

# Pesky





# pollen

*Hay fever hardly occurred a century ago. Why have people suddenly started to suffer so much since the '70s?*

■ TEXT: ANOUSCHKA BUSCH

## Hay fever because of the heat?

**T**he existence of hay fever was discovered some 200 years ago by the Liverpool doctor John Bostock. He was amazed that he was troubled by a blocked nose and fatigue every year around June from the age of 8. He had tried all sorts of strange things to get rid of the ailment: cold baths, bloodletting, opium and vomiting. Nothing resulted in change. To find out more about the disease he searched for other patients for 9 years. The yield was meagre: he only found 28. The ailment hardly occurred in those days. What was the cause? It had to be something that only happened in summer.

Colleagues suggested that it was the smell of fresh hay. Bostock had a different theory: it was the summer heat. The proof: he had hardly suffered since he had hired a house that was situated on a cliff at sea with constant fresh air during summer. His name for the disease? Summer mucosa inflammation. Charles Harrison Blackley discovered the real cause of hay fever a little more than 60 years later: the pollen of grass and trees.

**I**tchy eyes, uncontrollable sneezing and a runny nose. It is that time of the year again: hay fever. And just as the weather is getting nicer ... Small comfort: you are not the only one. Hay fever sufferers are allergic to plant pollen that floats in the air. Your immune system reacts as if the pollen that enters your nose is a dangerous intruder. The purpose of the teary eyes and runny nose? Getting rid of possible infections as quickly as possible. In itself a very healthy reaction. The only problem: the immune system reacts to a substance that it does not have to react to. Our body has nothing to fear from pollen. Why does the immune system of one person react so badly and others' not at all? And why has the number of people with allergies risen over the last few decennia?

### ● Name is wrong

Hay fever is a badly chosen name, because both hay and fever have nothing to do with the ailment. It is actually the pollen of fresh, flowing grass that people with hay fever are most allergic to. And a good second: tree pollen, especially birch. Some

plants, like ragweed and mugwort, are infamous allergy causers as well. And lots of people are allergic to dust mites and dander from animals. This is not called hay fever, but it is acutely the same ailment: an allergic reaction to innocent particles that we breathe in.

Why does the immune system of hay fever patients react specifically to these substances? What could make grass pollen or dander seem so scary? That is still unclear, explains immunologist Huub Savelkoul of Wageningen University (NL). "The protein in the pollen probably resembles the protein found in infections." The immune system also recognises these so-called 'allergens' in people without allergies. It just doesn't do anything about it. Savelkoul: "With people who do not suffer from an allergy, the immune system 'wants' to react. But it doesn't do that because it is actively suppressed. This goes wrong with people who do have an allergy."

### ● Sick from tomato pollen

It is still unclear why this immune reaction is not suppressed in some people. What is known is that hay fever is partly hereditary. ▶



# The immune system of the hay fever patient learns in the long run that pollen is harmless

► Normally you have a 15% chance of getting hay fever. But when one of your parents suffers then this goes up to 25 to 30%. This increases to 70% when both parents suffer. But also the degree to which you are exposed to allergens plays a role. In the Netherlands people are mainly allergic to the grass that grows there. In Japan, people get hay fever from the pollen of the Japanese cedar, which is the most common tree. A single clump of grass or tree will not do anything. Hay fever is only developed with enough exposure to the pollen. The allergy is gradually built up. Some say that you need exposure to a certain pollen for a minimum of 2 seasons before an allergy can develop.

Not all pollen causes hay fever, even though it is an allergen in principle. The pollen that people have allergic reactions to comes from wind pollinators – plants or trees that make use of the wind to spread their pollen. Flowers that are pollinated by insects, like the much talked about grown tomatoes and peppers, normally send too little pollen into the air to make people allergic. This would only affect people who work in greenhouses. They have a lot of contact with this pollen and could become allergic to it.

## ● Smoke aids allergy

There are more factors that determine if you will suffer from hay fever, like hormones. Allergies often arise during puberty, around the age of 12 or 13, or suddenly get worse around that time. Also, certain particles in the air can irritate the nasal mucosa, which increases the allergic reaction. For example, cigarette smoke or diesel particles that are emitted in traffic. Stress also seems to enhance the allergic reaction, while exercise has the opposite effect.

Another important factor is your age. Young children do not suffer from hay fever, because the immune system has to be fully developed first. On the other hand you can also outgrow it. Most people no longer suffer from hay fever some 20 to 30 years after their first time. Savelkoul: "As you age your immune system reacts less and less to pollen. The wrong reaction, if suppressed, eventually stops." This is also the principle on which immunotherapy against hay fever is based. Here a hay fever patient is injected monthly (or a tablet is given) for 3 to 5 years with the substance that he is allergic to. This accelerates the learning process of the immune system, which extinguishes the

reaction sooner. But why does it take hay fever patients so long before their immune system realises that pollen is completely harmless? That is still a mystery.

## ● Are we too clean?

Another mystery: why do we suffer more from hay fever nowadays than in the old days? The disorder hardly occurred a century ago. But the number of hay fever patients in the Western world exploded around the '70s. Also, other allergies like for dust mites and asthma occurred more often, while the number of allergy cases of the population of third-world countries was still as low as with us a century ago. Apparently something in our modern Western lifestyle ensures that more allergies arise.

Maybe a decreased exposure to infection in the early childhood years, suggested epidemiologist David Strachan in 1989. It is known as the 'hygiene hypothesis'. Not only are we living much cleaner, we are

## Does grass resemble oranges?

Hay fever sufferers have more chance of a food allergy. It is called a cross-reaction. The body reacts to other substances, because the protein in them resembles that of the allergen. An allergy for birch pollen often goes hand in hand with a food allergy for hazelnuts and apples. An allergy for grass pollen can sometimes lead to a food allergy for oranges, tomatoes and peanuts. Mostly the allergic reaction is quite harmless: an itchy feeling in the mouth and throat and a swollen tongue. In rare cases a more severe reaction occurs and the throat swells up so much that it leads to breathing problems. Anaphylactic shock could even occur: an extreme immune reaction whereby the blood vessels of the whole body dilate. This can lower the pressure in the blood vessels by too much to keep the vital body functions in working order, with possibly fatal results.

SHUTTERSTOCK



Healthy food can be deadly for those with allergies.



## Worms against hay fever?

**Y**es, it is pretty gross: little white worms teeming in your faeces. But who knows, one day you may purposely infect yourself to get rid of your hay fever. When immunologist David Pritchard of the University of Nottingham (UK) did field work in Papua New Guinea 20 years ago he was struck by the fact that the people hardly had any allergies or autoimmune diseases. They did suffer from a lot of hookworms. The correlation that he made seemed correct. The worms manipulated the

immune system, in order to survive, in such a way that the reaction of the immune system of the body was a lot less severe against the worms in the intestines. Pritchard wondered if an infection of hookworms could also cure hay fever and asthma. His first experiments with hay fever patients were merely meant to establish the safety of such an experiment. But many test persons were so excited about their 'medicine' that they didn't take the tablets to get rid of the worms.

## Kissing helps

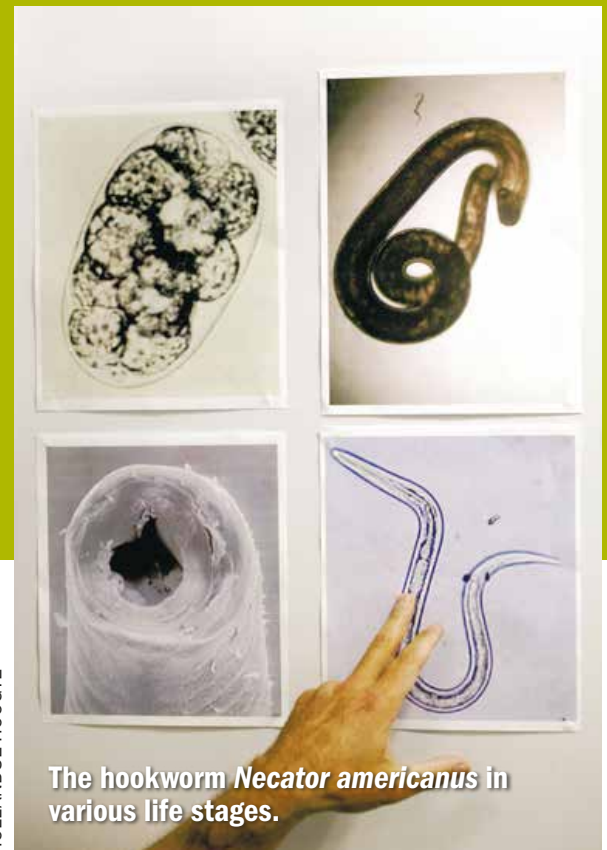
**K**issing someone with a constant runny nose is probably not very appealing. But it would be performing a good deed. A good kissing bout can lessen hay fever symptoms, according to research by Japanese allergist Hajime Kimata, then working at the Satou Hospital in Osaka (Japan). He asked 24 test persons with hay fever to kiss for half an hour with their partners. The amount of IgE antibodies (that are responsible for allergic reactions) lowered substantially, as seen after blood tests. A long cuddling session didn't have this effect. Why does kissing help against hay fever? Kimata thinks it is the relaxing effect of it. It is known that stress can enhance allergic reactions. The question remains: why would kissing be more relaxing than cuddling?

And when you don't have anybody to kiss? Then just take a little pill.



### ● Old friends

But a bored immune system is not the only possible explanation. Contrary as this may sound: it could also be that some infections indirectly help our immune system a little. From a lifesaving aspect they suppress the immune reactions, whereby allergic reactions arise less quickly generally. Our immune system has gotten used to the fact that



The hookworm *Necator americanus* in various life stages.

## Fast facts

- In South Africa we don't often see the silver birch tree cross-allergies that happen when you eat certain fruits like apples, pears, cherries and hazelnuts. This is, however, very prominent in Western Europe.
- Up to 20% of the South African population suffers from seasonal allergic rhinoconjunctivitis (hay fever).
- Pollen spikes at certain times of the year. In early spring (late August) we start with tree pollen. This is followed by a big surge in long grass pollen from September to February. Weed pollens follow in late summer and fungal/mould spores (less problematic) can be seen in autumn.

certain microbes and parasites are present in our body according to this 'old friend hypothesis'. It has gotten used to the fact that allergic reactions are regulated by their presence. If you remove the infections, then the number of people with allergies will rise. Whether this is really the explanation for the increase in allergies still remains to be seen. The problem is also that research is often contradicting. From some studies it appears, for example, that having measles at a young age has a positive effect on allergies. But most research shows that it makes no difference. We will have to wait a little longer for a definite answer. Savelkoul: "At this moment we still know too little about the changes in the immune system and the underlying mechanism with allergies in general and hay fever in particular." ■

[braintainment@panorama.co.za](mailto:braintainment@panorama.co.za)

Grass pollen on its way to pollinate other grass plants ... or to make a human sneeze.

HOLLANDE HOOGTE

also vaccinated against diseases and we use a lot of antibiotics. Our immune system has to do less to fight infection. It could get 'bored' and react exaggeratedly against innocent substances. Clues for this? Children who grow up in a big family, go to a crèche early or live on a farm suffer less from allergies. And they are exposed to more infections than others.



## How do you lose weight the scientific way?

# Thought for food

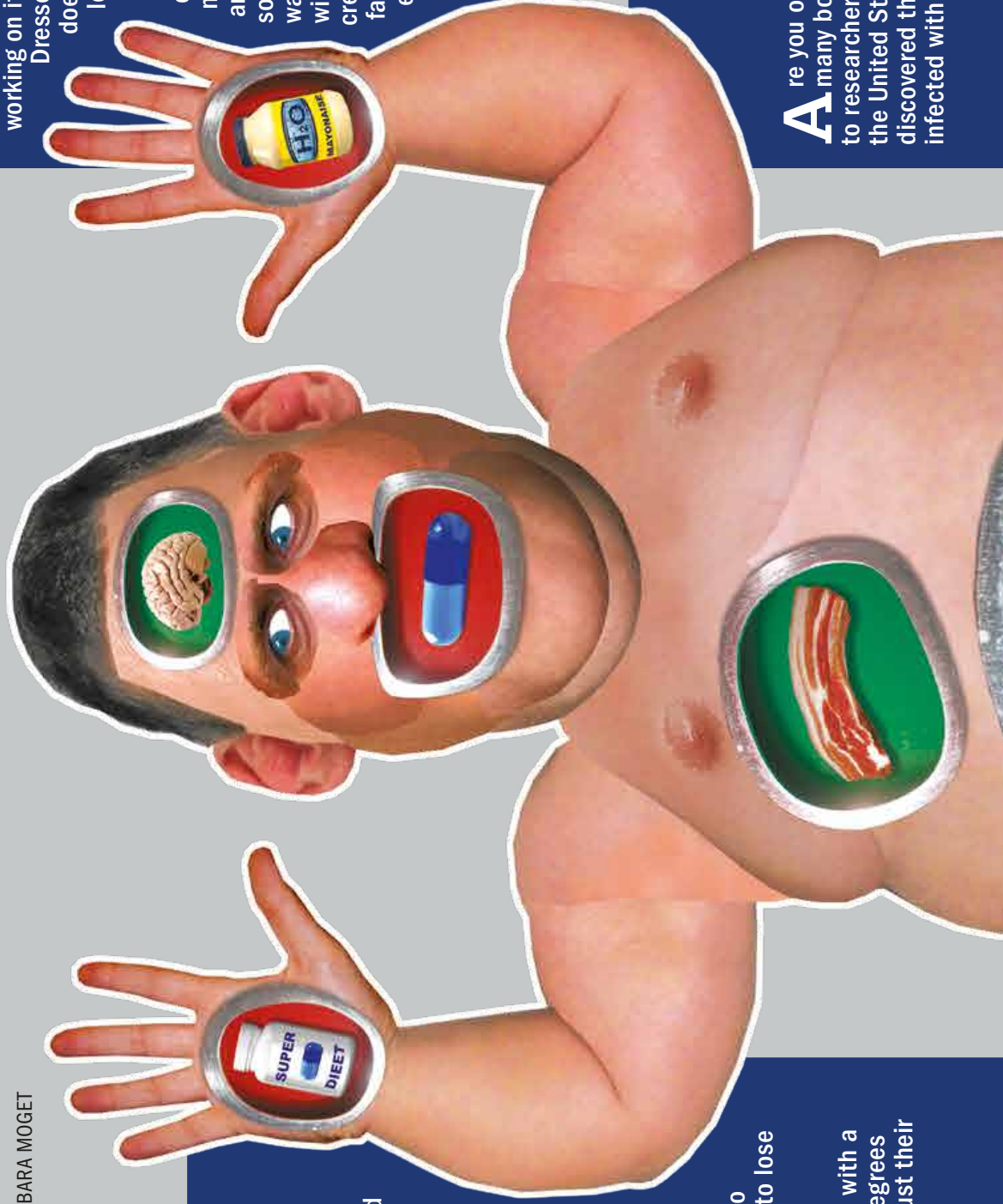
*Forget extreme diets and sweaty gym sessions. There could be scientific ways to lose weight in the future. Here's a look at 4 ways researchers believe might help you shed those unwanted kilograms.*

■ TEXT: MELANIE METZ, ILLUSTRATION: BARBARA MOGET

## 1 Acquire brown fat

**W**hite fat consists of stored nutrients and without exercise this will stay where it is. On the other hand, brown fat is the tissue that burns the white fat and keeps your body temperature at the right level. For a long time it was thought that only babies, who don't move around much, have such a brown fat layer. But researchers of the UMC Maastricht in the Netherlands discovered that many adults also have brown fat. Could this help to lose weight?

The researchers tested this with people. They were put in a room with a temperature of 16 degrees, 4 degrees below room temperature, with just their



## 3 Eat water mayonnaise

**W**hy mess with the body if you can make food that doesn't make you fat? The University of Wageningen in the Netherlands is working on it at the moment. Chemist Diane Dresselhuys discovered in 2008 that food doesn't have to contain real fat, as long as it feels creamy in your mouth.

Food technologist Koen van Dijke searched for a substance that tastes creamy, but isn't fat. How do you make an 'emulsion' of fat droplets and water with less calories? You do so by filling the tiny fat droplets with water. The fat layer on the outside will keep the water in and still taste creamy. One could replace all the fat droplets with water droplets in emulsions such as mayonnaise and ice cream. You could consume litres of it and still remain slim. For now we have to be content with low-fat mayo because van Dijkjes' fat water droplets are not for sale yet.

## 4 Blame the virus

**A**re you overweight because you eat too many boerie rolls? Probably not. According to researchers of the University of California in the United States, being fat is a disease. They discovered that a number of obese children were infected with a virus, the adenovirus 36 (Ad-36).



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underwear on. Then they were placed under the scanner. In thin people, brown fat was visibly active to get the body warm again. Fatter people seemed to have little or no brown fat. However, the latter could be remedied with the aid of PRDM16. Researchers of the University of Pennsylvania discovered this in 2008. They injected PRDM16 into mice and the little guys produced brown fat cells. These burnt the ordinary fat and the rodents lost weight. The mice who received PRDM16 stayed the same weight, even after a high fat diet. Now, we just have to see if this will work with people.

## 2 Paralyze your brain

Disengaging a part of your brain might sound rigorous, but it could prevent many eating bouts. Psychologists at the University of Missouri in the United States discovered that a part of your amygdala, an almond-shaped mass of nuclei located deep within the temporal lobe of the brain, could play a part with gluttony. They were referring to the so-called basolateral core. This core was disengaged in a group of mice. Then they received a substance that made the rodents go searching for food. Once they found the food, they didn't eat it. Another group of test rats were starved of food for a day. Their basolateral core was disengaged, but they didn't receive the substance. They happily munched on. The conclusion: stopping part of the brain will only work with compulsive eating disorders, according to the researchers. This might be ideal for people who continuously eat even when they are not hungry. Still, it's not a good idea to stop the function of the basolateral core in humans. This part of the brain is also important with emotions like fear. A lack of fear could be dangerous. Just think, you could get run over in dangerous situations like traffic.



The virus would affect the fat cells. The cells react by producing more fat cells. Of the 65 test subjects that the Americans researched, 19 had been infected with Ad-36. This number was too low to use as convincing evidence, but it is motive for more research into overweight caused by infection. That Ad-36 fattens chicken and mice was already concluded from research done in 2007 at the Pennington Biomedical Research Centre in the United States. It would be good news for lazy dieters if the virus indeed causes overweightness in humans. All you need to do is get a jab against Ad-36. But keep on eating and you will still gain weight, but now you can blame the virus.

## Weight control rip-offs

Smart traders earn big bucks from miracle slimming powders and pills. Often these don't work and might even be downright dangerous. Taking some of these will not make you lose weight:

### ● Pregnancy course

Pregnancy does not make you slim. Still, some offered the pregnancy hormone hCG (human chorionic gonadotropin) as a slimming tool. The FDA conducted an investigation and concluded that there is no concrete proof that this stuff works. As a result, the substance was banned from being used as a weightloss device.

### ● Lousy pill

The slimming pill Reductil seemed ideal for patients who were extremely overweight. The active substance in the tablet, sibutramine, gives you a saturated feeling. Even doctors prescribed it to patients who couldn't lose weight by dieting alone. However, the pill had a nasty side effect: it raised the chances of stroke or heart attack. It was taken off the shelves in 2010.

### ● Get stacked

Fat burning tablets (or stackers) used to contain the stimulatory substance ephedrine. Ephedrine was banned in 2000 when a whole list of health risks appeared, like addiction, high blood pressure and heart problems. Stackers are still for sale though. The stimulatory pills now come from guarana plant extracts.



### EXTRA INFO

[www.dietcam.org](http://www.dietcam.org): The Diet Scam Watch keeps an eye on which products are a fat load of nonsense.



## Eight misconceptions about Native American tribes

# The native truth

*First, Westerners mistook them for being Indians from Asia. Propaganda, thanks mainly to Hollywood, had us thinking that they had names such as Dances with Wolves and used monosyllabic words such as 'ugh'. However, this is a far cry from what Native American people were. Here's the truth.*

■ TEXT: BERRY OVERVELDE

### 1 War cries

**P**aint on your face? Check. Sitting on a horse? Check. Tomahawk ready? Check. Now you are nearly ready to go to war. The only thing left to do is use your hand to tap your mouth and produce the 'wahwahwah' war cry before you head off into battle. This is according to the stereotyped image. But what was the reality? It is known that many Indian tribes used to shout out all sorts of war cries beforehand to motivate the war party. But that is not 'typical' Native

American tribe behaviour, because dozens of armies also used such war cries (the Japanese 'banzai' is a well-known example). Also, it would be unlikely to encounter male warriors screaming 'wahwahwah'. The sound was mainly made by the females and the sound was made without the use of their hands. The hand gesture was probably made up by white Americans who couldn't make the sound without using their hands.

### 2 They say 'ugh'

**H**istory tells us that Native Americans grunted the word 'ugh'. This is not true. Firstly, there were several hundred tribes who spoke different languages or dialects. So even if one tribe would have said 'ugh', they surely didn't all say that. And 'ugh' itself? It never would have been a real word but rather a corrupt version of 'how', also written as 'howgh' or 'hugh'. The interjection 'ugh' surfaced centuries ago as a disapproving groan in the English language. But in Native American culture this word was probably a greeting. Other sources saw the 'ugh' as an agreeing reaction when another person was finished speaking. The word probably became popular due to Western story writers such as Karl May. However, they used it incorrectly. Some writers also used 'ugh' to indicate that a person had stopped speaking. Others wrote that the word was a gesture of disapproval, just like in the English language, while in reality it was probably a sign of agreement. In short: Native Americans might have said 'ugh', or something that resembles this, but differently from how we think. And it certainly wasn't a real word. Ugh.



And if they had a chance they would attack innocent colonists.



### 3 Scalp collectors

**B**een to battle? Then you naturally want to take a trophy home. Chopping off heads is an option. But scalping, cutting off the hair and skin of the victim's head, is more practical. Why? Because it was easier to take back to the camp. Native American tribes have become notorious for their acts of scalping. And from history we know that a lot of scalping took place even before the arrival of the Europeans. For example, in 1325 the battle of Crow Creek in South Dakota between rival tribes resulted in many deaths. When archaeologists exhumed the bodies, they found that the majority of the dead had been scalped. Many people think that scalping was unique to Native American tribes. But this also happened in other parts of the world. The Greek historian Herodotus wrote for example that soldiers from Scythia (people from Eastern Europe and Central Asia) already collected scalps: the more, the manlier. And the European colonists in North America also took part in this. Large rewards were dished out regularly for the collection of Native American scalps. This led to many scalp-hunting expeditions.

Scalping is not typically Native American. The Scythians already did this centuries before. And the European colonists also took part.





No, these are not wigwams. The ladies are erecting their teepees.

#### 4 All tribes camped

**T**eepee, wigwam, call it what you want. But the fact is that Native Americans lived in tents. At least if you want to believe the most popular movies and books. If you do, you would be wrong. There were hundreds of Native American tribes and each one's dwelling place varied. Indeed, some lived in tents such as wigwams or teepees. They are not the same: wigwams are small hoop-shaped structures, while teepees consist of a few poles and animal skins. The latter was mainly used by nomadic Indian tribes on large planes in the middle of the USA. That's because the tents were quick and easy to assemble and take down while they were on the move. But there were also lots of tribes that were not nomadic and did not live in tents. A case in point: tribes that lived along the East Coast built plank houses – long, shaped wooden structures with pointy roofs that looked a lot like European houses. Other tribes stayed in chickees (huts with raised floors and pointy roofs) or pueblos (houses made of clay).

#### 5 Doing the rain dance

**S**ome countries get more rain than others, which helps produce fertile agricultural land. Twenty-four states in the USA get more than 1,000mm of rain per year. This excludes the very wet Hawaii, which gets even more. Hence, the tribes that lived in these fertile regions would not have had much need for a rain-making ritual. In the dry South West they did have

rituals that had something to do with rain-making. The most well known is that of the Hopi from Arizona, who used live snakes during their dance. These dances were meant to welcome and celebrate the rain. But they were not quite the type of rain dances that we are thinking of (tribe wants rain, tribe makes a dance and voila: here come the clouds already, ugh!) The snake dance of the Hopi, for example,

was part of an annual ritual in August, normally the wettest time of the year in Arizona. Such a rain dance was thus not meant to 'make' rain, but probably had more to do with a harvest festival.

Rain is not the only reason for a song and a dance. This is the war dance of the Ojibwe tribe, carried out by Flying Cloud, Tobacco, Moonlit Night and Flying Seagull.





# At least 5 million Native Americans were counted at the last census in the USA



Sioux chief Sitting Bull (1831-1890).

## 6 He who has a very long name

**D**ances with Wolves or He Who Kills a Whole Herd of Bison with Bare Hands. Many Native Americans have long and elaborate names in Hollywood movies. The reality is that many Native Americans had (and still have, even today) several names. There was a birth name, a nickname and other names that they were given as they grew up.

Take Chief Sitting Bull (around 1831-1890), famous leader of a group of Lakota Indians. At birth he received the name Jumping Badger. His nickname was *Slon-he*, or in other words Slow (he was rather slow as a child). And then when it was celebrated on his 14th birthday that he had grown into a warrior, his father called him *Thathanka lyothanka*, meaning Sitting Bull. It all sounds very poetic, yes, especially in comparison with names like Jack and Jill. But translating names into a different language makes them sound more poetic. Alexander means something like 'protector of mankind' and Beatrix 'blessed woman'. What about having a whole sentence as a name? This did not happen. Most names were 1 or 2 words. These only change into several words, or sometimes a full sentence, once you translate them. *Hiawatha* for example then becomes 'He Who Combs'.

## 7 A feather in your hair?

**H**ow would you describe a Native American? Many would probably say they had reddish complexions and wore feathers in their hair (preferably eagle feathers). Nobody can blame you for this answer, because almost every Native American who you see in comic strips and Western movies has feathers in his hair. This probably originated among the Sioux and later also became popular with other tribes. But not every tribesperson was important enough to put feathers in his hair. Also, many Native American people used head attire other than eagle feathers. Tribes in the North East often wore a headband with a feather, but that could just as well have been a turkey or heron feather. Other tribes wore porcupine quills or reindeer tails. There were even others, in the American West, who wore 'ordinary' hats, braided from tree roots.



Yes, there were tribes that wore feathers on their heads, but not all of them.

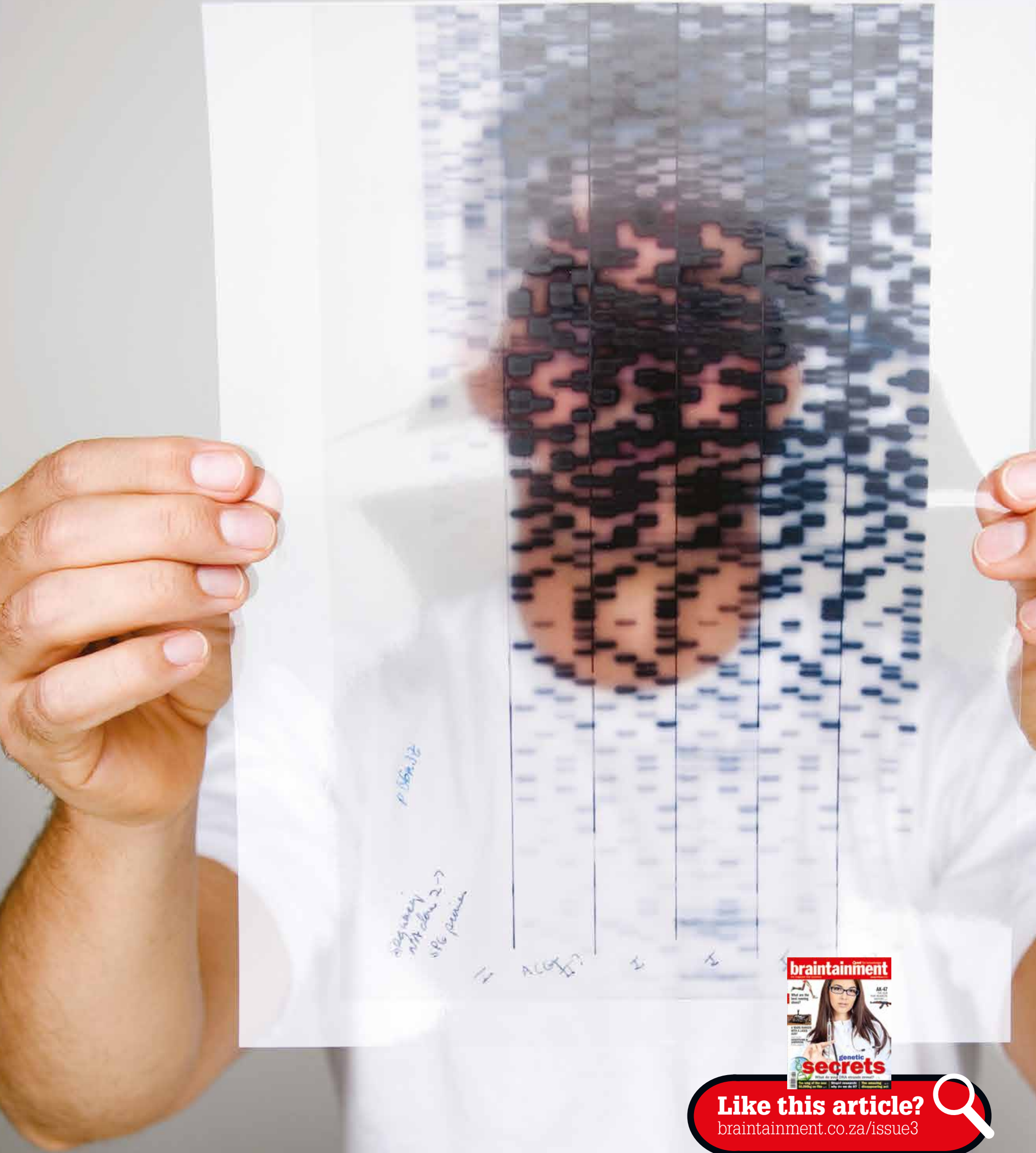
## 8 Almost extinct

**M**any Native American tribes are almost extinct. Many only exist in reserves: pieces of ground that the government has assigned to them. It is true that after the arrival of the Europeans in America the size of the native population decreased due to diseases such as smallpox, while others were killed in battle. Exactly how many is not known. It is impossible to ascertain how many people were on the other side of the Atlantic Ocean before Columbus crossed over in 1492. The estimation that historians make of the original number of native habitants varies a lot. But it is probably several tens of millions. These include tribes from Central and South America as well. According to the most recent census of the population in the USA (2010) there are about 5.2 million Native Americans in that country. Their numbers have indeed decreased dramatically since 1492, but they are not quite on the verge of extinction. Also, of the 5.2 million Native Americans, only 22% live on reserves. More than half of the other 78% live in urban areas.

### ! EXTRA INFO

*The Native Peoples of North America: A History* by Bruce Johansen: a history of Native Americans, from their arrival in America until now.





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# Does commercial analysis of your DNA produce anything useful or are you just an 'eager-spitter'?

# Genetic secrets

*Commercial companies offer DNA analysis cheap-cheap. But what can you actually do with it? Dutch journalist Hidde Boersma had his DNA profile compiled and investigated the phenomenon. We asked a local genetic counsellor to comment on what the implications of such tests would be for South Africans.*

■ TEXT: HIDDE BOERSMA, ANSIE VICENTE

**H**idde Boersma has mail! A packet the size of a largish diary lies in his post box. The packet contains only a tiny tube, a loose lid and a manual – nothing more. It's from 23andMe, an American company that will determine your genetic profile for US\$99 dollars (about R1,000). To do it they need his DNA, which they isolate from his saliva. He clears his throat and aims a mucus ball carefully into the tube. It doesn't comprise much more than a quarter of the minimum volume, and suddenly his saliva seems to have dried up. It takes 15 minutes before the tube is full. Lid on, the package is back in the post on its way to the US. Boersma's genetic adventure started a week ago. One afternoon he surfed a site called 23andMe. "Gain insight into your traits, from baldness to muscle performance," the site says. "Discover risk factors for 97 diseases. Know your predicted response to drugs, from blood thinners to coffee. And uncover your ancestral origins." He clicked on the large red 'Order Now' button and confirmed that he was aware of the risks. And let

**A bit of saliva in a test tube – that's pretty much all you need for a test.**

it be known that he's happy for 23andMe to use his results in their scientific research. A week later, the package landed in his post box.

## ● Hot tests

13 years ago, scientists had their first successes in mapping human DNA. Their research into the 3 billion or so genetic letters (called



base pairs) in our DNA took about 15 years, and cost about 3 billion euros (R30 billion). These days, technological advances mean that DNA analysis can be done in a few sleeps, and for a fraction of the cost. This, of course, means that companies offering the analysis are sprouting ▶

## An alcoholic, blonde baldie?

**G**enetic profiles don't only reveal serious issues. Under the heading 'Characteristics', there's a whole series of features to peruse. According to 23andME I am highly likely to have blue eyes (true), blonde, wavy hair (true), and a small propensity towards baldness (true thus far). Some more hidden

characteristics also come to light – not all of them too funny. Boersma has known for a while that he's not lactose-intolerant. "I've been eating dairy products for years with no problems. And, sadly, I'm not resistant to malaria or HIV. But my DNA code reveals a sensitivity to alcohol addiction." Whether he develops the

addiction, however, would depend on his education, life experiences and the influence of the wrong kind of friends. But people who have 'sensitive' genes are more likely to resort to alcohol and drugs when life hands them lemons. Fortunately, he comes from a happy family and has wholesome friends.





**960,000 base pairs are investigated. It seems a lot, but it's only 0,032% of your total DNA.**

► up all over the place. It may sound like fun, but what can you actually do with a genetic test? Aren't you just what cynics call an 'eager-spitter' or 'information exhibitionist', someone who simply wants to boast that they've had the profiles compiled? Companies certainly cater for that too – you can have your DNA profile printed onto canvas to hang in your lounge if you like. But isn't it scary to know what information about you is genetically determined? Let's start here: 23andMe doesn't map your full genetic sequence. Neither do most other genetic businesses. Why? The largest part of your DNA, more than 99,5%, is exactly the same as every other human being's. So there's little use in determining your specific genetic sequence for those bits. Besides, scientists still know very little about the function of a

significant portion of our DNA. This is why 23andMe only looks at the pieces of DNA that have known influences on health or physical characteristics. In total, they only analyse about 0,032% of your DNA. That's about 960,000 base pairs.

Noelene Kinsley, who recently completed her Master's in genetic counselling at Wits University is one of only a handful qualified genetic counsellors in SA. She believes that submitting your DNA to a website is all good and

## Is a 37% higher risk of lung cancer something to worry about?

well for Caucasians, but for Americans – and South Africans – it might be a bit more tricky. "Most studies about gene-linked illnesses have been done on European populations. There are only a limited number of studies on African populations. Yet we know that there are certain conditions in which the genes are race-specific. Like albinism, for instance. While both Caucasian and African people can suffer from albinism, the gene that codes for albinism in Africans is completely different to the one which codes for albinism in Caucasians. We're not talking about different mutations of the same gene, but completely different genes! And albinism isn't the only disease for which this is true."

### ● Family means more

Six weeks pass. 23andMe sends Boersma a message saying his genetic profile has been completed. It's available online for his

perusal. And suddenly it's all very personal, almost too close to home. Will he know soon which illnesses will affect him in future? Not necessarily, says Kinsley. "Your family history, current medical conditions and specific markers in your blood, like cholesterol and sugar levels, are actually much better predictors of future illnesses than your genes." As far as Boersma knows, there are no genetic illnesses in his family.

"Then the chances are incredibly small that the analysis will reveal anything useful. You could do it for fun, but it won't give you much to work with on a medical level. "But if inherited illnesses are part of your family history, you stand the chance of having a nasty mutation. And in that case you have to ask yourself if it really is something you want to know. It's also important to consult with your family before having your DNA analysed. After all, a large part of their DNA is the same as yours. This means if you have a serious genetic illness, the same might be true for the rest of your family."

"Plus if you do have genetically-linked diseases in your family, it's better by far to do the tests via a human genetic specialist than via a website. The results have a huge emotional impact. So you have to prepare for the results, and have the proper emotional support. Also, the results themselves mean little without understanding how all sorts of other factors can affect them. Going via a professional will give you a better interpretation of the results and how they could affect your life than a simple web page would."

### ● Long list

The email from 23andMe contains a link to Boersma's personal test results, divided into a section on kinship and a section on health. He clicks on the risks for illness, and sees a list of about 100 diseases. Then he clicks on 'heightened risk'. There are 20

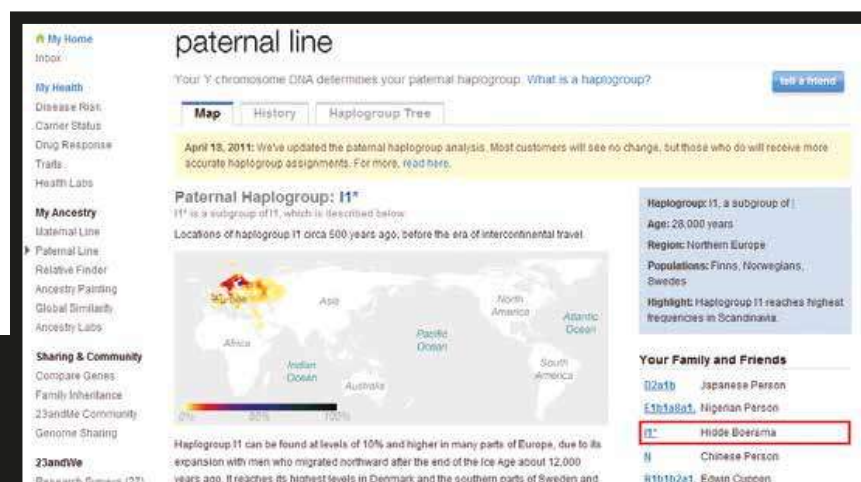
## Where do I come from?

To determine where Boersma's mom's ancestors come from, 23andMe tested his mitochondrial DNA (mtDNA). This DNA is passed on only via your female line. He has the advantage as a male of being able to trace his paternal line as well. This is done by analysing a particular part of the Y chromosome. It's only passed on from father to son.

Neither analysis reveals anything spectacular: Boersma is clearly a European of Caucasian origin. For most Europeans, whose families have been living in the same place for ages, this type of analysis won't reveal anything exciting. But for South Africans, Kinsley says, the test can reveal much. "The vast majority of white South Af-

ricans' ancestors migrated to SA from Europe about 10 to 15 generations ago. Maternal and paternal DNA lines can therefore be traced back to a location in Europe. And because so many of those immigrants married or had children by Malay and African slaves, Indian migrant workers, Chinese miners and the various other people who

flocked to South Africa during the gold rush, white South Africans are also able to trace their roots back to Asia or the rest of Africa. South Africans of African descent can not only see where in Africa their forefathers came from, but also where in Europe or Asia. All of this can have an influence on their disease profiles."





## What do DNA profiles actually reveal?

**I**t's useful to think of the human DNA profile like a map to a new country you've never visited. Now imagine that there are big tears and smudges all over the map. So while you have a general idea of where you are, you can't be sure that the road you're on is actually going to get you to where you want to be. And you might think you're going along the correct road, but you've

actually missed a turn-off. "That's a good way of looking at what we know about the human DNA profile. We have big gaps in our knowledge – the tears and smudges. We know that certain genes make you 'travel' in a certain disease's direction. But there's no guarantee you'll get it. And you might think you got to where you were going but actually you're in a completely different town."

diseases on the list. The absolute and relative risk for each disease actually manifesting is listed next to its name. At the very top? Lung cancer, with a maximum of 4 stars indicating reliability of the test. That means it's been thoroughly researched. It seems Boersma has a 37% higher chance than the average person to develop cancer of the respiratory tract. "It might look like a lot, but the numbers can be deceiving," says Kinsley. "Imagine 1% of all people get a disease and you have an 80% increased risk of getting that same disease. That still means you have only a 1.8% chance of getting it. It is a bit worrying, but such a small risk is really not something to put you into a funk. You have to look at the absolute risk as well."

### ● Bigger risk of cancer

And the absolute risk of lung cancer on Boersma's report is 11.6%. That means a chance of about 1 in 9 that he will develop the disease as opposed to the normal risk of about 1 in 12. So 'normal' risk is fairly high already, and his is slightly above average. "But," says Kinsley, "actually developing cancer, or other complex diseases like diabetes, high blood pressure and heart disease, depends on the interaction between genes, lifestyle and a load of other factors. Lifestyle alone can be a huge influence. And we have scientific proof that lifestyle makes a difference to everyone's health, not just those with higher genetic risks. Plus we don't yet know for sure what the interplays of the various genes are in these more complex diseases, which is why the results of tests

like these won't ever really be able to predict precisely whether you'll develop those diseases."

The influence of some genes is explained on the 23andMe website. In the case of lung cancer, genes only have an 8 to 14% influence on the development of lung cancer. "Smoking is by far the largest risk factor for lung cancer," Kinsley says. The fact that Boersma doesn't smoke is therefore much more important than the few percentage points of extra risk his DNA profile seem to indicate. "Growing to a healthy old age is not determined by your DNA profile as much as by your lifestyle and environment: drink in moderation, don't smoke, eat healthy foods and get enough exercise. We have scientific proof that that kind of lifestyle has an effect on your overall health. We simply don't know enough about the influence of most of our genes to rely too heavily on the results of DNA analysis, unless there's a known genetic condition. DNA is certainly not the be-all and end-all of your disease profile."

### ● Mutation affects sister

Boersma's other 'plusses' are negligible. They revolve around conditions that are so rare that even doubling the chances of developing them means minimal risk. The list of lowered risk is longer, but also nothing earth-shattering. It's really just about minimal reductions in risk. According to Kinsley that's also typical. "There are dozens of genes involved in most complex diseases. A plus here is countered by a minus there. Now add in the



DNA analysis used to be very expensive and took ages to complete. These days it's cheaper and faster.

crucial aspects of lifestyle and environment, and you start understanding why the test results are often just about moving a few percentage points up or down. Your personal risks will more often than not be somewhere near the average, maybe a little above or a little below, but nothing to be too concerned about." One exception is information. 23andMe only reveals information behind a picture of a lock. Sometimes mutations can have

effects much bigger than a few percentage points. In this category, 23andMe checks for changes in the BRCA- and LRRK-genes. Mutations in these genes increase your chances to 80% of developing breast cancer and Parkinson's disease respectively. The lock over the breast cancer BRCA-gene is particularly close to Boersma's heart because his mom had breast cancer. If the mutation is present, it could affect his sister. But he also knows that

## Bad DNA = no insurance?

**I**sn't knowing all this stuff about your DNA dangerous? What if it lands in the wrong hands? Like those of medical aid or life insurance companies? Do you have to pay a higher premium if you have 'bad' DNA? In South Africa, medical aids work on a 'community rating' basis. This means medical aids can't load your premiums if you have a specific disease. However, life insurance can be loaded for certain risks. There are very specific guidelines for how genetic information can be used by life insurers, Kinsley says. "But my research has indicated that most South African life insurers do not use DNA profiling to assess their risks. However, for some very specific diseases, called monogenic conditions (like cystic fibrosis), where we know a single gene is 100% predictive of that disease, genetic tests may be used."

Smoking has a greater influence on your health than a tiny 'fault' in your DNA.



# It's useful knowing that your DNA doesn't react well to certain medicines

► his family has no other history of breast cancer, and that his mom was 52 when she was diagnosed. That increases the chances that it was an age-related breast cancer, which is much less likely to be genetically determined. Still, there's a moment of anxiety as he clicks on the little lock. A pop-up asks if he really does want to know. He does. So he clicks on 'Yes'. The page opens up, with the very comforting info that there are no mutations. And even though he knows better, he still heaves a sigh of relief. Kinsley is concerned that this very sensitive test is being done without any level of counselling beyond confirming that Boersma does want to know the answer. "I applaud 23andMe's desire to point out how sensitive the results of the test are by using the little lock. But the reality is that everyone has a level of curiosity. It's like Pandora's box. Because of his family history, it would have been better for Boersma to have counselling and the brca test under medical supervision. The brca gene causes inherited breast cancer in 5 to 10% of all people who develop breast cancer. But BRCA is not the only gene that is involved in breast cancer. So

while Boersma feels relief, there may actually still be underlying issues. He seems to now have peace of mind, but it may be a false sense of security," she says.

## ● Which medicines work?

The only useful information the tests do deliver, according to Kinsley, relates to Boersma's 'medicine sensitivities'. "Many medicines for cancer and some anti-depressants only work for a certain group of people. It's often because they have the perfect genetic profile for the medicine," she says. "By matching DNA and medication, you can offer the patient much better treatment."

But she foresees 2 problems. The first is that the science of matching profiles to medicines is in its infancy. So 23andMe only tests for 19 types of medicine. Still, she believes the amount of test-able medicines will increase over the next 5 years or so. "It's not only good for the patient. It also makes healthcare much more affordable. So doctors will be prescribing less medicine they're not sure will work." It seems Boersma is barely sensitive to the medications used to treat Hepatitis C. Useful to

know, because Hepatitis C meds are heavy. "In my case, therefore, I'd probably elect not to undergo treatment should I ever contract the virus. I'll just have to live with a chronic infection. It will probably be rather tedious, but certainly not impossible," says Boersma.

And that's the second problem Kinsley has: people could end up using their interpretations of the results to either self-medicate incorrectly, or make suspect decisions about future healthcare. "It's disturbing that Boersma doesn't even look at other possibilities. Hepatitis C is a horrible disease – and there is other medicine available than the one he's not sensitive to. Which means he may be choosing to suffer unnecessarily."

## ● Behaviour change?

So what is Boersma going to do with the information he now has? Will he change his lifestyle? Kinsley is pretty skeptical. "All the research we have indicates that people don't change their lifestyle. Everyone knows you have to live a healthy life. So all the DNA analysis does in the case of someone who doesn't have reason to be concerned

about his genetic profile is confirm that fact. But it's hard to change your behaviour. Just look at how many people still smoke, even though we all know the dangers."

Boersma says while he finds it interesting to surf through his genetic profile, it doesn't really give him any new insights. "After 2 weeks I noticed that my interest in the genetic profile had faded. I was so looking forward to getting the results. But now that I have the results, it's hard to suppress a vague sense of disappointment. My view: DNA analysis remains a useless luxury, unless your family history requires it to ensure your children are healthy." Kinsley agrees. "Do it for the fun, if you want to. But do it with the knowledge that almost every disease we know of has some genetic influence." ■

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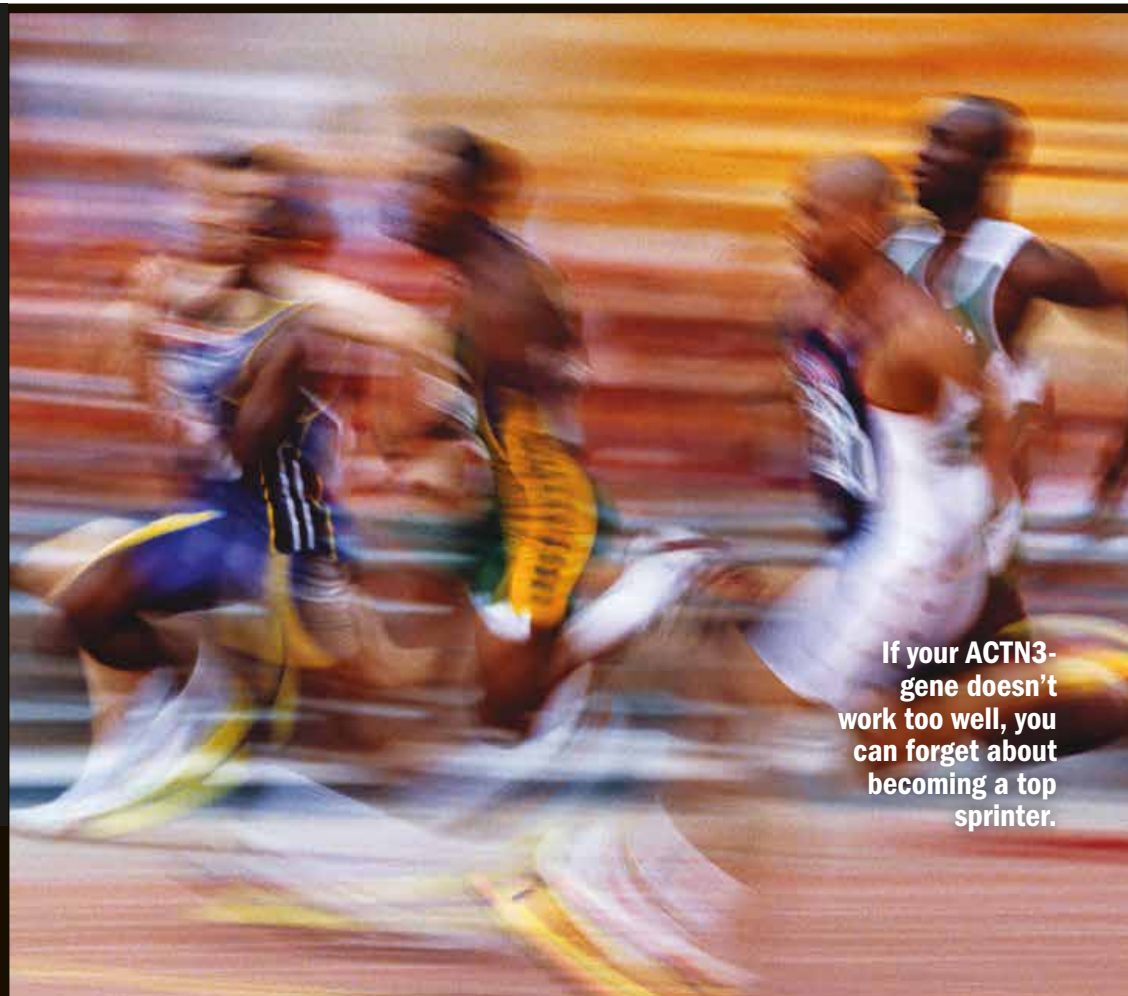
## ! EXTRA INFO

**Local sites for genetic testing**  
[www.geneticcounselling.co.za](http://www.geneticcounselling.co.za)  
**Kinsley's website**  
[www.dnalysis.co.za](http://www.dnalysis.co.za) and  
[www.gknowmix.co.za](http://www.gknowmix.co.za)

## Sprinter or marathon runner?

**N**eed to run off some festive season excesses? 23andMe tests if your muscles are better suited to sprinting or marathons. We have 2 types of muscles. One type is used for fast actions, like sprinting. The other is useful for endurance sports like long distance running or cycling. Normally, you'd have about equal quantities of each type in your body. But people who have a mutation that inactivates the so-called ACTN3-gene, have virtually only the endurance muscles. On average, only about 18% of people have that specific genetic variant,

but about 80% of marathon runners have it. Sprint champions like the current 100m and 200m sprint Olympic champ Usain Bolt, have an active ACTN3-gene. So a genetic test can be quite useful in determining which sport you'd be good at. But sadly simply having the right genetic profile doesn't mean you don't have to train to become a champ. You don't get good physical conditioning and technique from your DNA. Luckily for Boersma, he likes tennis. It's a real sprint-sport and his DNA analysis says his muscles would be perfect for it.



If your ACTN3-gene doesn't work too well, you can forget about becoming a top sprinter.



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### What is Big Data?

*According to IBM 90% of the data in the world today has been created in the past two years.* We are now producing and storing massive amounts of data ("big data") in different formats from sensors, instruments, application logs, transactions and a variety of activities. This data can be used to identify patterns, regularities and potential useful features for solving various fundamental, practical and commercial problems; both for advancing knowledge but also for commercial and social value purposes. "Big Data" captures the idea of managing vast amounts of data using a variety of modern computing technologies and infrastructure for a variety of different kinds of sources. To manage, develop and understand the required technologies, experts trained on the intersection of subjects from statistics, information and computer science, system design and social sciences are needed. The "BSc Honours in Big Data" programme is designed by the School of Computer Science at Wits to blend multi-disciplinary subjects together and to provide students with the research and professional skills to master and design smart technologies.

### JOIN OUR LEADING ACTUARIAL SCIENCE PROGRAMME

The Programme celebrated the 30th anniversary of the first graduating class in 2014. As at the end of 2014, Wits had produced over 1300 graduates with an Actuarial Science Major, now working on six continents. The Programme has produced a remarkable 507 qualified Fellow Actuaries, making it one of the most successful at producing Fellow actuaries, and 25% of the Fellows are female, compared to an SA population proportion of 20% in 2014. The 4 year programme offers exemption from 12 of the 13 Board Examinations of the Actuarial Society of South Africa, the most of any South African university.

### Understanding the links between MATERIALS around us and HUMANITY

*What is materials science?*

Two of the major challenges for humanity in the next 20 years are related to the availability of energy-fuels, and environmental issues because of the ever-increasing usage of those fuels and the resulting impact on climate and the environment. Finding solutions to these needs will largely depend on the ability to develop appropriate materials. Examples include materials for hydrogen storage and materials that have high efficiency, low toxicity and are bio-degradable. This requires a study and the design of advanced functional materials, so-called "smart" materials. Materials science involves investigating the relationship of atomic-scale structure to physical properties (for example, magnetic, electronic-electrical, mechanical-elastic and optical). Until we understand the physics and chemistry of these materials better we may be under-estimating their true technological potential. Understanding materials science in turn contributes to an understanding of materials engineering aspects where the properties may be tuned or tailored to have predetermined "smart" properties for use by the commercial world.

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Learn how to tackle the challenges of modern astronomy, astrophysics and cosmology. Be ready to join the group of professional astronomers in South Africa. With the Square Kilometer Array (SKA), the High Energy Stereoscopic System (H.E.S.S.) and the South African Large Telescope (SALT), three world class observatories operating all in Southern Africa close together in an unprecedented multi-frequency range, the BSc in Astronomy and Astrophysics at Wits University will equip you with the foundation knowledge right at the start of your university career for you to become a leading astronomer in one of the fastest growing areas of research in South Africa. SKA, H.E.S.S. and SALT are expected to generate vast quantities of ground-breaking data that wait for new generations of scientists to be fully exploited.

### Wits University has been awarded the Centre of Excellence (CoE) in Mathematical and Statistical Sciences

by the Department of Science and Technology (DST) and the National Research Foundation (NRF) to promote collaborative research, and provide support and training in priority research areas.

### HIGH IMPACT LAB IN PHYSICS

The new state-of-the-art High-Throughput Electronics Laboratory (HTEL) in the Wits School of Physics is the exemplar for future scientific endeavours in South Africa. The HTEL will not only play a big role in science and in developing high-end technologies, but it is also the blueprint for innovation where "like-minded scientists and colleagues who have a single-mindedness to change the world, will come together".

### IS NUCLEAR ENERGY SAFE?

By studying nuclear science you become better equipped to answer questions that are hotly debated by researchers around the world.

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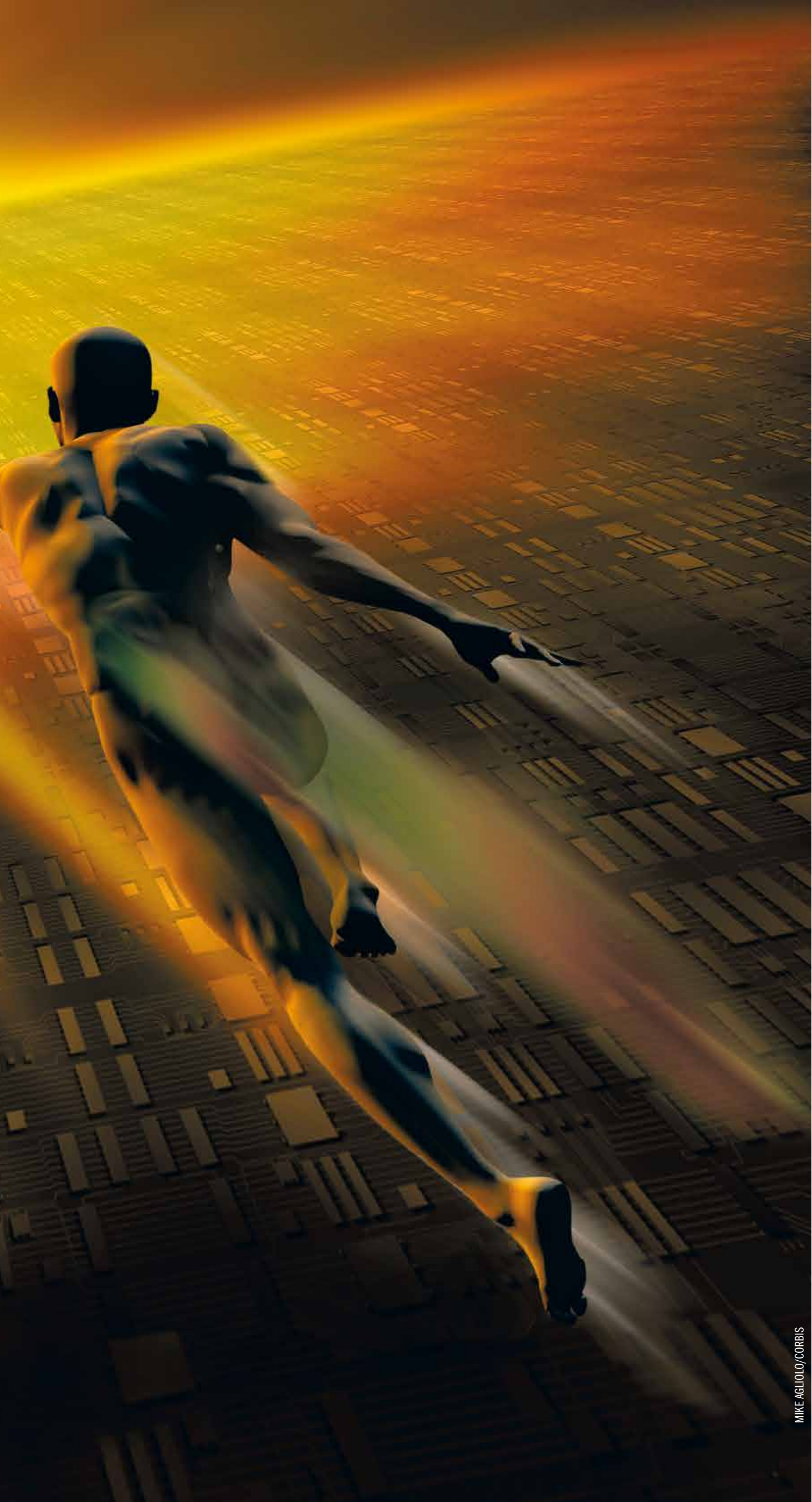
A trip to the future is quite possible,  
but getting back is a problem

# Beating the clock

*Imagine if you had the ability to travel through time. You could go back and see yourself as a toddler, or you could journey to the future to see the value of your shares in 10 years' time. But how do you do that? Is it impossible or just very difficult?*

■ TEXT: MARC KOENEN





MIKE AGUILO/CORBIS

**I**n old television programmes, it was always very dark in space. The spaceships from the series *Star Trek* journeyed, where no man had ventured, more than half a century ago, and all you could see was darkness broken only by a handful of bright spots. These bright lights were usually stars or planets that the 23rd-century crew was travelling to. Subsequent series were very different from those of yesteryear. The 2010 movie version of the sci-fi series was full of colourful clouds, fast-flying comets and close-ups of brightly lit stars. This wasn't only because of the bigger budget and technological advances, but also because new telescopes gave a very different view of space. This was greatly down to photos taken by the Hubble telescope. Now, movies depict spacecrafts of the future zooming past exploding stars and along planetary mists that are shown in all the colours of the rainbow.

It's worth noting that every image of the future shown on screen indicates the time when it was made. For example, the first episodes of *Star Trek* have furniture and hairstyles of the crew in line with fashion of the '60s. Even the equipment, with psychedelic turning lights, was taken from that era. Things will look very different in the 23rd century. How so? To get to know that, you have to make a trip to the future. And that is less science fiction than you think.

### ● Blast off

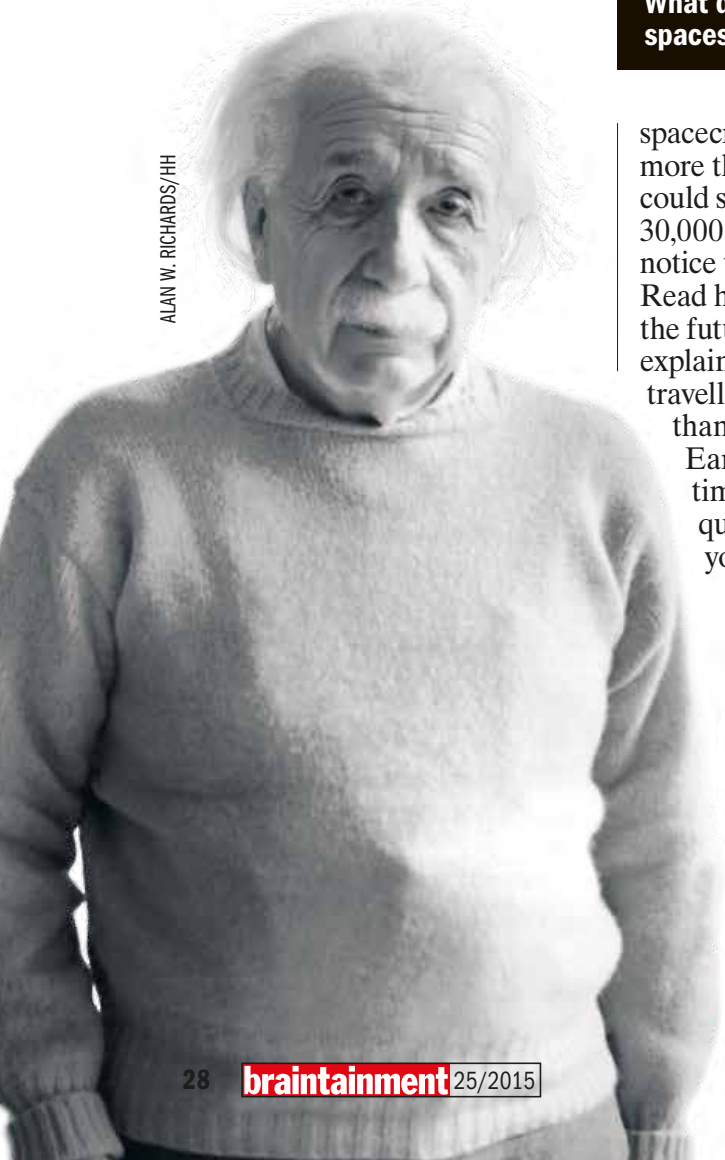
The fundamentals for a scientifically possible time trip come from Albert Einstein. Nobody had a clue as to how you could make a trip into the future before Einstein published his theory of relativity in 1905. Einstein couldn't carry out the solution that he devised, but nowadays there is nothing strange about it: 'just' take a trip through space. Your rocket is your time machine; just don't expect to be forwarded 300 years with a snap of your fingers like we often see in sci-fi movies. It takes time to land in the future. The trick is to speed up your life, which is your present journey to the future.



# If you travel fast enough, you will land up in the future

► You now live one second per second. To see the future, you have to live up to a 150th of a second. Then you will be able to fast-track to the future, and the best way to do that is with a really fast spaceship. Russian Cosmonaut Joeri Gagarin was the first man to orbit around the Earth in 1961. Never before had anyone gone faster. And at that moment, no one had gone further into the future. All right, Gagarin didn't get very far, the other earthlings were only a nano-second ahead of him after landing. More was not possible with his Vosto rocket. We need a faster spaceship to get further into time. It has to be a spaceship that gets close to the speed of light, almost 300,000km per second. Present-day

ALAN W. RICHARDS/HH

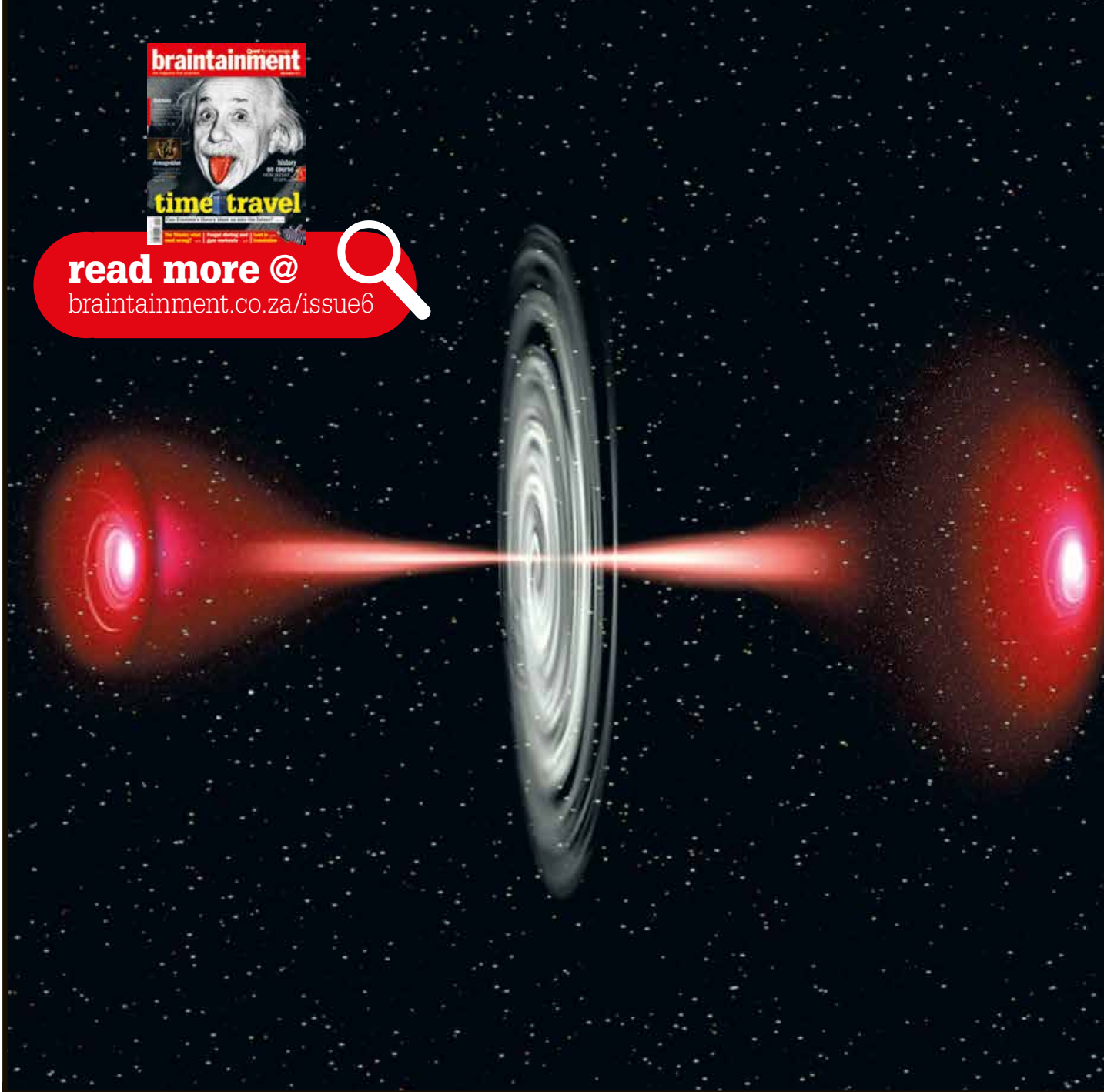


"I never think about the future. It will be here soon enough."

Albert Einstein  
(1879-1955),  
German scientist



read more @  
[braintainment.co.za/issue6](http://braintainment.co.za/issue6)



What does a wormhole look like? We don't know. Is it too small for the smallest spaceship to pass through or large enough to gulp up Earth? We have no idea.

spacecrafts don't even reach more than 0,003% of that. If we could speed them up to at least 30,000 times faster, then you will notice the time effect really well. Read how it works in 'Rocket to the future' on page 29. It explains why a clock in a travelling spaceship runs slower than a clock that stays on Earth. In other words: for a time traveller, time goes quicker on Earth than in your spacecraft. Every

second that you fly, 50 seconds pass on Earth. This increases as you go faster.

## ● Speeding up

So what kind of craft do we need for that? On the outset, we won't need one that goes 1,000 times faster than present-day spacecrafts. If that were to happen, you would be squashed to death immediately. No, the spaceship has to build up speed gradually. (For the passenger, it

could be nice if this happens around 9.8m per second. The body is used to that because that is the same acceleration that we have here on Earth with gravity. When you drop something, it will fall 9.8m per second). For convenience sake, there will be a clock on board that displays the time at home on Earth. Imagine the scenario: your rocket takes off and accelerates every second. The 'Earth' clock will run faster and faster as time

## Time travel censorship

**P**alace was a blockbuster television series in China. A woman falls in love with a painting from the Qing dynasty that ruled the land from 1644 to 1911. She travels back in time and has all sorts of affairs with various princes. But the Chinese government

stopped the series. In fact, they banned all programmes in which time travel is done. The reason: Authorities find nothing positive or constructive in these programmes. They think that time travel is fatalistic, leads to myths, has weird complications, and let people



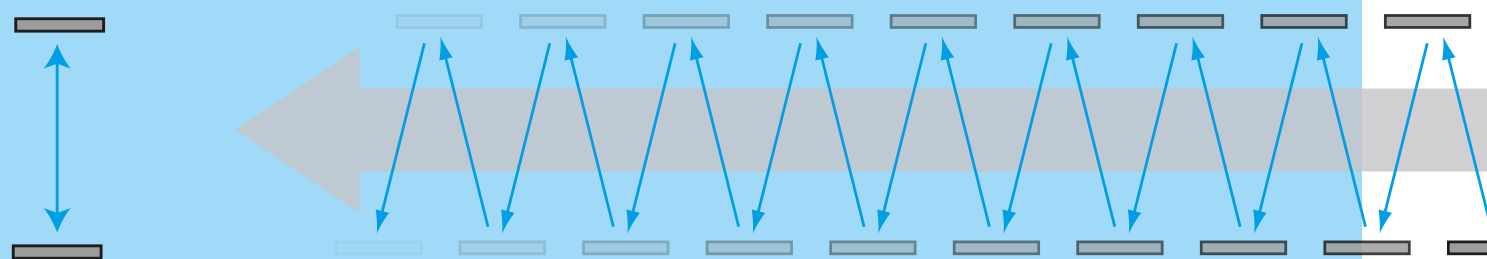
## Rocket to the future

**W**hy does someone travelling in a spaceship fly to the future? This has to do with how you move and experience time. First, it's the movement. Think about a travelling train. Someone who stands along the tracks sees the passengers in the train come past. They move while the passengers themselves sit still. Who moves and who doesn't depend on your own movements.

However, this does not work for light. Light always moves at the same speed, whether you move or not. Nobody knows why. This is apparent from experiments even though our brain tells us differently. Now, suppose this train has a clock that bounces a light pulse between 2 mirrors. The clock ticks every time the pulse hits the mirror. When you sit in

the train, you will only see the pulses move up and down. But someone along the tracks will see a zigzag movement. The train has moved in the time that the pulse has moved from one mirror to the other. The pulse has moved horizontally as well as vertically. In other words, the zigzag pulse travels a further distance. This is only possible because the zigzag pulse has more time even though both

pulses travel at the same time. This is true because the time in the train is slower than the one looking at it on the outside. The same goes for a spaceship. The longer it travels and goes faster, the bigger the difference. A year in a spaceship takes longer than a year on Earth. More time has elapsed at the same time than in your spacecraft. You land, in other words, in the future.



A clock in a moving train keeps time by bouncing a light pulse between 2 mirrors. On the left, the clock as seen by a passenger in the train: the pulse moves up and down (vertically). On the right, the same clock seen from the outside of the train along the tracks: the pulse zigzags. Outside, you see the pulse travel a greater distance and this will make the clock in the train seem slower than a clock outside the train.

“I will not take a wager that time travel will be possible in the future. The other person might know the future and know the answer.”

Stephen Hawking (1942), English  
Professor of Theoretical Science

goes on. When your watch tells you that you have travelled for 10 months, the ‘Earth’ clock will have done a year. The difference will grow more through the constant acceleration. Flying for 5 years, according to your watch, would be 75 years on Earth. Then, it's time to go home again. Why? You will get too old to arrive alive if you keep on flying. First, you have to slow down to be able to turn around. This will take another 5 years.

believe in monsters and reincarnation. They are, in short, ‘unhealthy’. Opposition to the regime think that this interdict was carried out for a completely different reason: Chinese citizens are not allowed to think that they could change history.

RIA NOVOSTI/HH



Joeri Gagarin, the first man in space, landed a nano-second in the future.



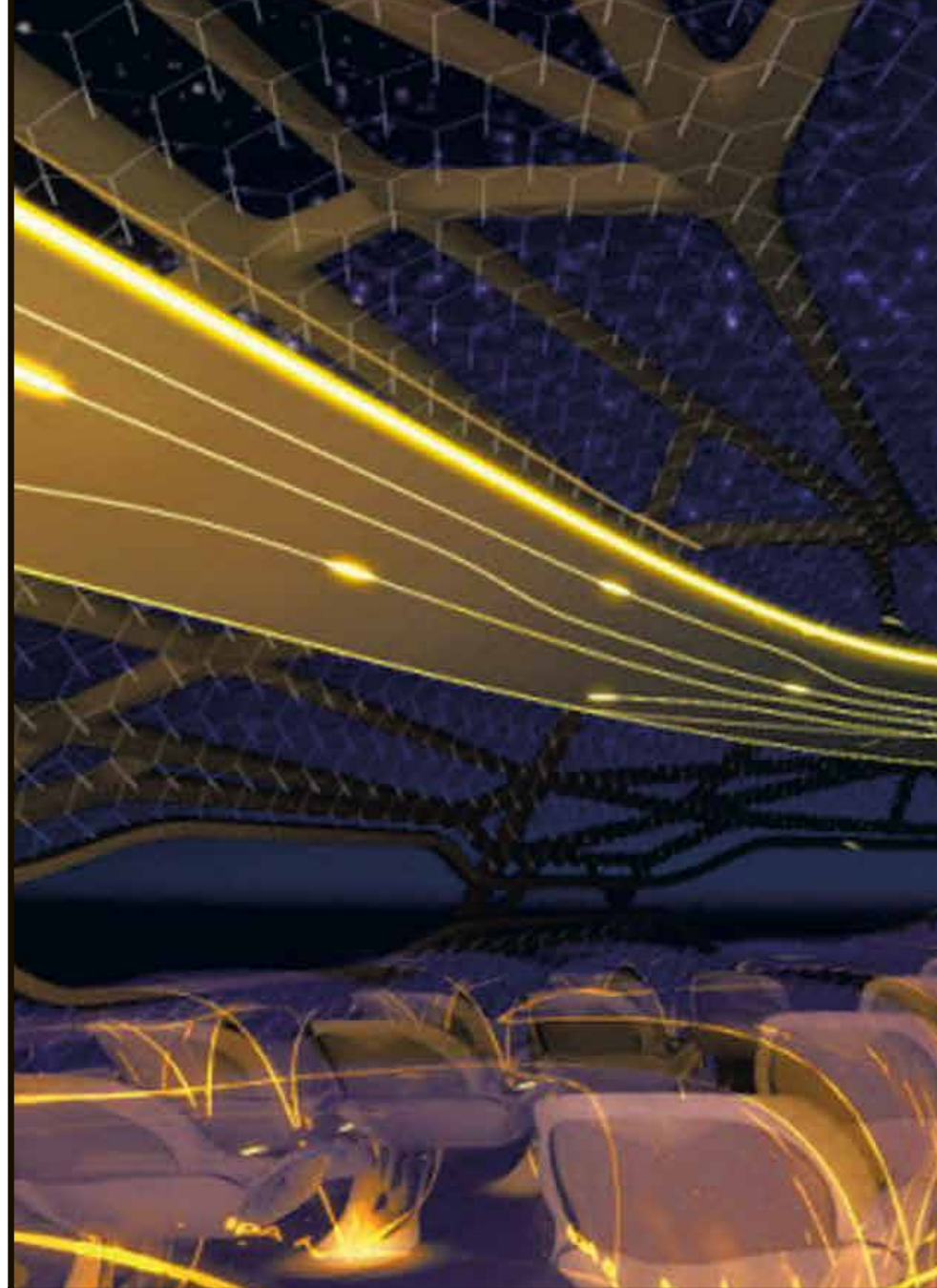
# Those who want to travel to the past have to move faster than the speed of light

► Your furthest point has been reached after 10 years. Flying back will take another 10 years: 5 years to slow down and another 5 to speed up. According to your watch, you have now aged 20 years. Meanwhile, here on Earth, we have passed 3 centuries. You can now shake hands with your great-great-great-great great grandchildren. This scenario is not science fiction. The propulsion will have to come from something very different than the engines of today. But from a physical point of view, there is no obstacle that would prevent such a trip to the future. It is difficult to execute in practical terms, but theoretically it is possible.

## ● Passing a cup of tea

Does the same apply for travelling to the past? This doesn't seem to be a problem in books and films. In *Star Trek*, the crew of the Starship Enterprise travelled back to New York in the crisis years of the '30s, 3 centuries before their time. How did they do it? They just stepped through the gateway called 'guardian of

eternity'. This doesn't exist in Einstein's relativity theory. According to the German genius, it is impossible to take a trip back in time. To do that, you have to overtake the light that has shone through the happenings of the past. Here's an analogy: When you see a full cup of tea, the light radiates to all sides. The light of the full tea cup has gone far into space by the time your tea is finished after five minutes. If you want to see that same full cup of tea, you have to find the radiated light, overtake it, pass it and wait for it. In other words, you have to move faster than the speed of light. However, that is not possible – not then, not now and not in the future. The speed of light is the maximum speed that can be reached in space. This is a law that always applies. However, there might be a way to circumvent the law of speed. That gateway from *Star Trek* resembles a physical concept that researchers call a 'wormhole'. In theory, it is an opening into a time dimension. In simple words: a wormhole would be a way to cut off the path of the previously radiated light. So, instead of overtaking the light of the full tea cup, one would have to find a shorter way to the place where the 'tea light' still has to arrive. You would be there first and see the past arrive. This shorter way is through a wormhole.

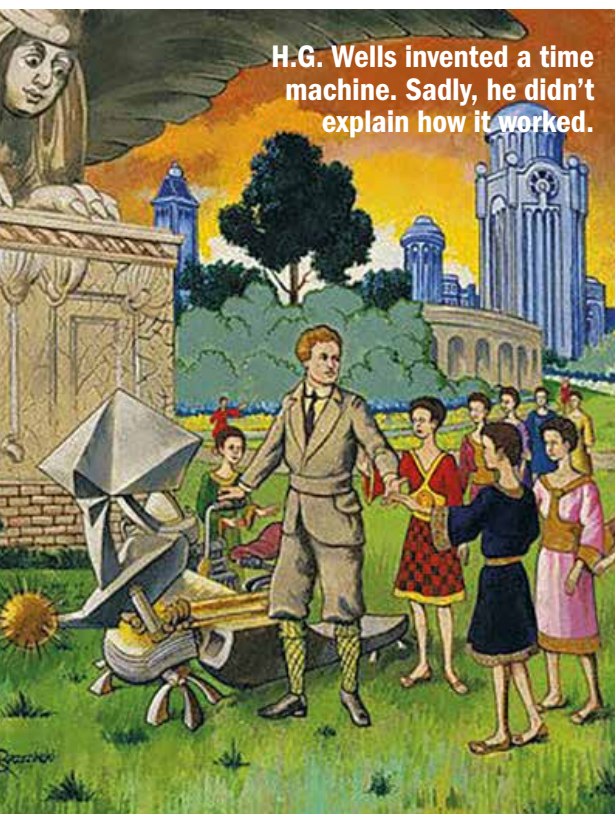


The distant future is not close by. Whoever wants to go had better get a comfortable spaceship.

## ● The door stays open

However, this is only the case if wormholes actually exist, because there is no conclusive evidence that they do. It looks like cooking upside down. Usually, one starts with getting the ingredients for a recipe and you then use them to test your culinary skills. But, now we start with the dish that we are going to

serve (the wormhole) and we have to figure out what ingredients have been used. We have to ask, is it time? Is it space? And what happens with that? Are they stretched? Accelerated? This is what physicists are trying to find out. "I expect that during the course of this century, it will be possible to ascertain



H.G. Wells invented a time machine. Sadly, he didn't explain how it worked.

## How did we travel through time in the past?

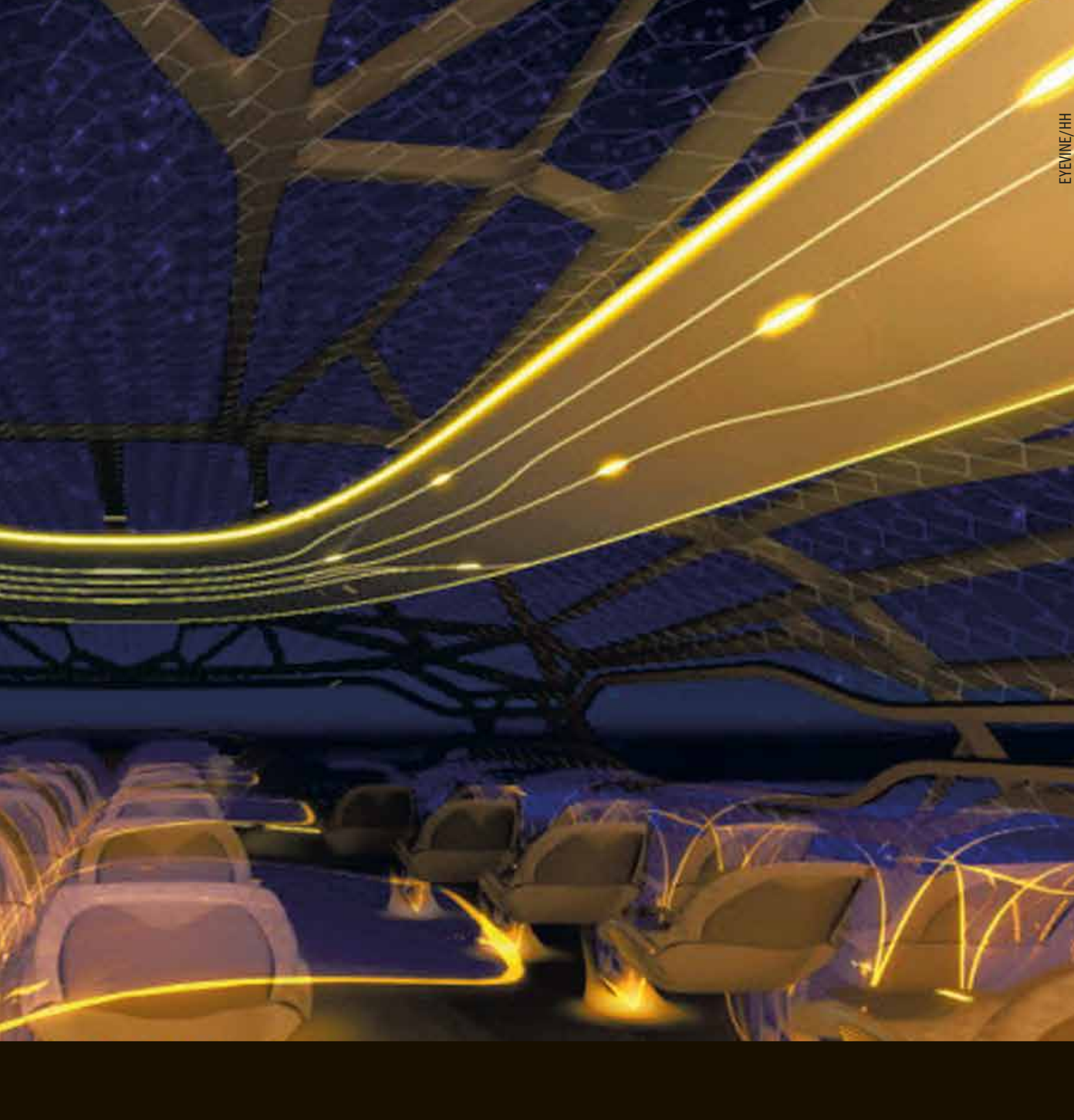
**M**an has been fascinated by time travel for centuries. It can be done seamlessly in movies and books. Here are a few examples:

- Godly power: The Japanese legend Urashima Taro from the 8th century tells us about a fisherman who stays underwater for 3 days with a godly sea dragon. When he arrives at home, 3 centuries have passed.
- Sleep: In the French book, *The year 2440: A dream if ever there was one* (1771), author Louis-Sebastien Mercier makes his lead person fall asleep and wake up in Paris of 2440. He sees the perfect society that is described in a lyrical way.

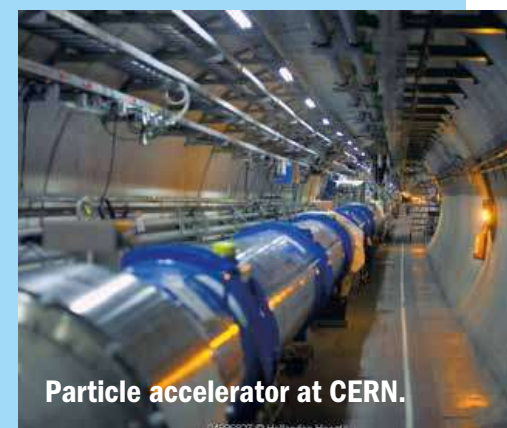
The message for the reader: today's life is bad.

- Magic: Norwegian poet Johan Wessel wrote a play called *Anno 7603* (1781). In the poem, a ferry transports a boy and a girl to the year 7603. The traditional man-woman parts have been turned around and the army comprises women only.
- Time machine: The first special machine for time travel comes from author H.G. Wells. The device became famous in his book, *The Time Machine* (1895). It had already appeared in his *The Chronic Argonauts* (1888). However, Wells fails to tell us how the time machine works.





EYEVINE/HH



Particle accelerator at CERN.

## Neutrinos are too fast

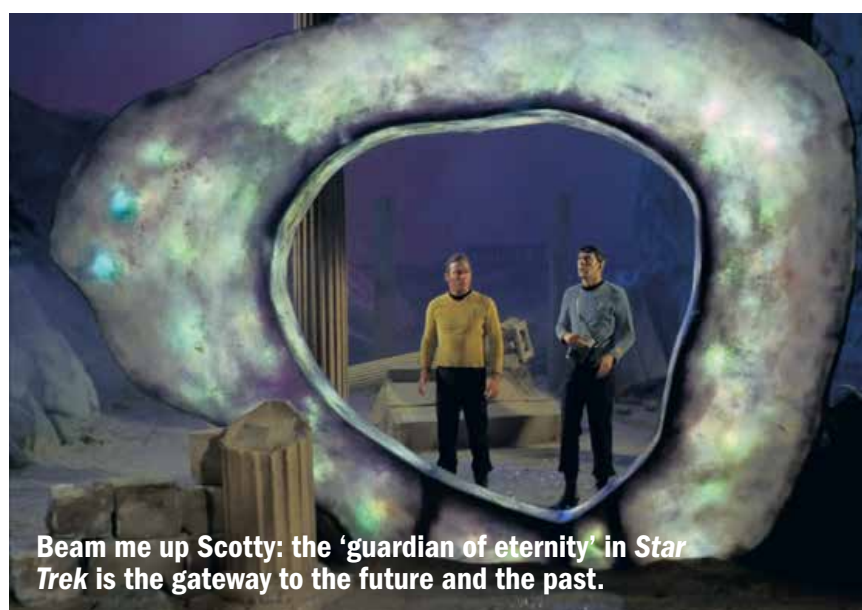
**S**cientists know better than anybody else that nothing goes faster than light. There are, however, elementary particles that do their own thing. These are neutrinos that were shot to travel a distance of 732km from Switzerland to Italy in a series of experiments. The starting point was a particle accelerator at CERN where they reached a speed close to the speed of light. The intention was that they would reach Italy 2.5 milliseconds later. However, some neutrinos arrived 60 nanoseconds faster despite repeated measurements. That made them faster than light. The researchers don't understand how this was possible, and have asked institutions with different particle accelerators to do the same experiment and to measure. The result surprised Professor Carlo Beenakker. "Within a few years, it will appear that mistakes have been made. I am convinced of that. Nothing travels faster than light. This is apparent from research from the last 100 years. One single experiment cannot prove the opposite." The media suggests that super-quick neutrinos opened the door to time travel. "Nonsense," stated Beenakker. "Even if it were true that the neutrinos travel faster than light, the particle would travel without time. You don't know if it comes from the future or the past. And if you don't know that, you wouldn't be able to do anything sensible with it."

"History could become experimental science if we could travel back to the past. The possible insights that we would acquire with our own history and origin are mind-boggling. I have no idea if it will ever be possible, but it is worth the trouble to re-search every possibility."

Carl Sagan (1934-1996), American astronomer

whether a wormhole exists or not," says Carlo Beenakker, Professor of Theoretical Science at the University of Leiden in the Netherlands. If it's not possible, it would mean that the door for a trip to the past is closed. According to Beenakker, the fact that astronomers have not detected a wormhole means nothing. "We don't even know where to look to find one. There are a few possible places and there are enough corners in space and in science that we don't know well enough yet." ■

braintainment@panorama.co.za



Beam me up Scotty: the 'guardian of eternity' in *Star Trek* is the gateway to the future and the past.



### EXTRA INFO

[www.livescience.com/16207-faster-light-discovery-time-travel.html](http://www.livescience.com/16207-faster-light-discovery-time-travel.html): **Is time travel possible?**

**Doctor Who: Series about a doctor who uses a machine, called a TARDIS, to journey through time.**



## Where do sperm cells get the energy to move?

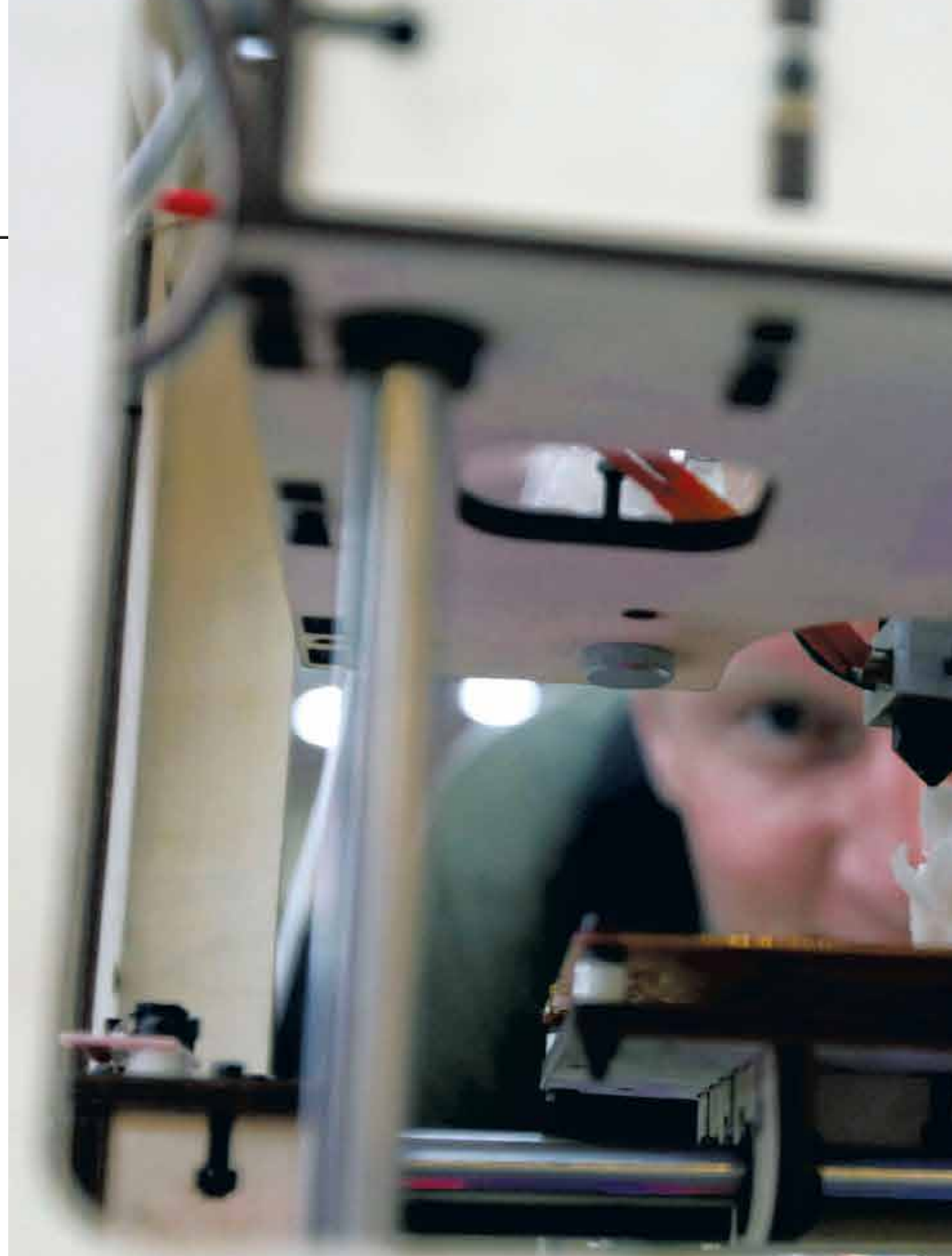
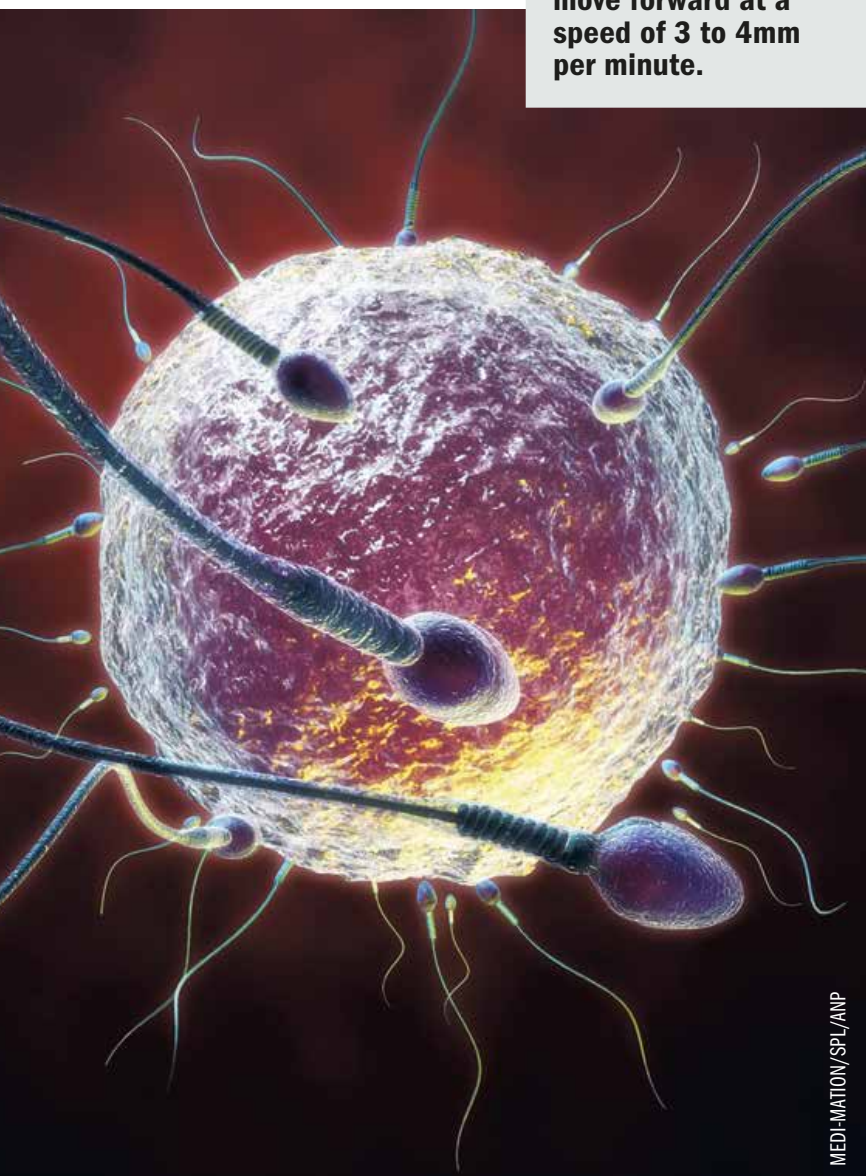
Mauray Rubio, North Riding

**S**perm cells move by turning their flagellum (tail) like a propeller. The energy for this comes from fructose in the sperm fluid. So-called mitochondria in the sperm fluid convert to fructose ATP (adenosinetriphosphate), the carrier of chemical energy in cells. The ATP goes to the motor protein, dyneine, in the tail of the sperm cell. There it is converted into movement.

Only one sperm cell can penetrate the egg.

### Q&A **FLASH**

- An ejaculation of a man contains about half a teaspoon of sperm (3mL).
- An ejaculation contains mainly seed fluid. Sperm cells form 1% at the most.
- Seed fluid feeds the seed cells, gives them energy and protects them against hostile cells and the low pH in the vagina.
- A seed cell can move forward at a speed of 3 to 4mm per minute.



## Is it possible to make a working plastic gun with a 3D printer?

Erick Nolten, Harrysmith







**A** well-functioning gun made from plastic is not possible. Plastic is not resistant against the heat and pressure that arises when you fire a bullet. The weapon would burst into flames when you pull the trigger. Parts that are under pressure, such as the barrel, have to be made of metal. The parts that endure less pressure can be made of plastic. Indeed, there are people who are replacing broken parts of their weapons this way.

LUO WEI/XINHUA PRESS/CORBIS

## O&A **FLASH**

- You can print almost anything you can imagine with a 3D printer. The main limitations are size and materials.
- 3D printing technology is developing rapidly. More and more materials may be used as a basis: ceramic, stainless steel, glass and even concrete.



## Does anybody 'tidy up' the internet?

Maureen Peters, Edenvale

**T**here is no organisation that searches the web for unused sites. Sometimes a site disappears because the owner takes it down. There are times when a whole lot of sites disappear because

a host goes bankrupt. However, many of the old disappeared sites can still be found on internet archives, like [archive.org](http://archive.org). The exact number of websites is unknown, but estimates run into hundreds of millions.

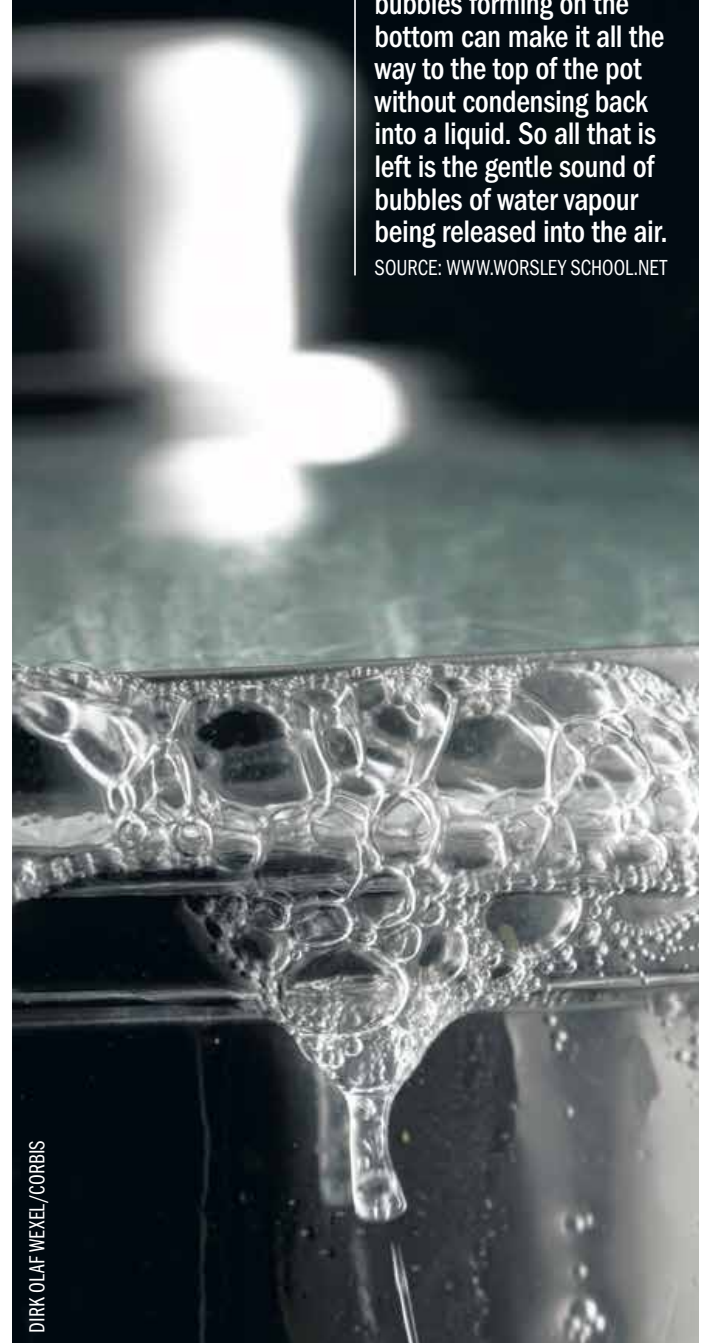
## Why does water make a noise before it boils?

Leigh Bekker, Port Elizabeth

**A**s the water is heated, the bottom layer of water gets hot enough (100°C) to begin turning some of the water from a liquid to a gas. This gas is called 'water vapour', and it forms bubbles in the liquid. Since these gas bubbles are less dense than the water around them, they begin to rise. At this point, however, the top layer of the water is still cool. When the water vapour bubbles rise into this cool layer,

they are cooled enough so that the vapour condenses back into a liquid. As the vapour turns back into a liquid, with less volume, the bubbles collapse. This leaves little holes in the water, wherever there was a bubble. The surrounding liquid rushes in to fill the empty spaces where the bubbles were. This makes 'popping' noises. Eventually the upper layer of water also reaches 100°C. When that happens, the bubbles forming on the bottom can make it all the way to the top of the pot without condensing back into a liquid. So all that is left is the gentle sound of bubbles of water vapour being released into the air.

SOURCE: [WWW.WORSLEY.SCHOOL.NET](http://WWW.WORSLEY.SCHOOL.NET)



DIRK OLAF WEXEL/CORBIS





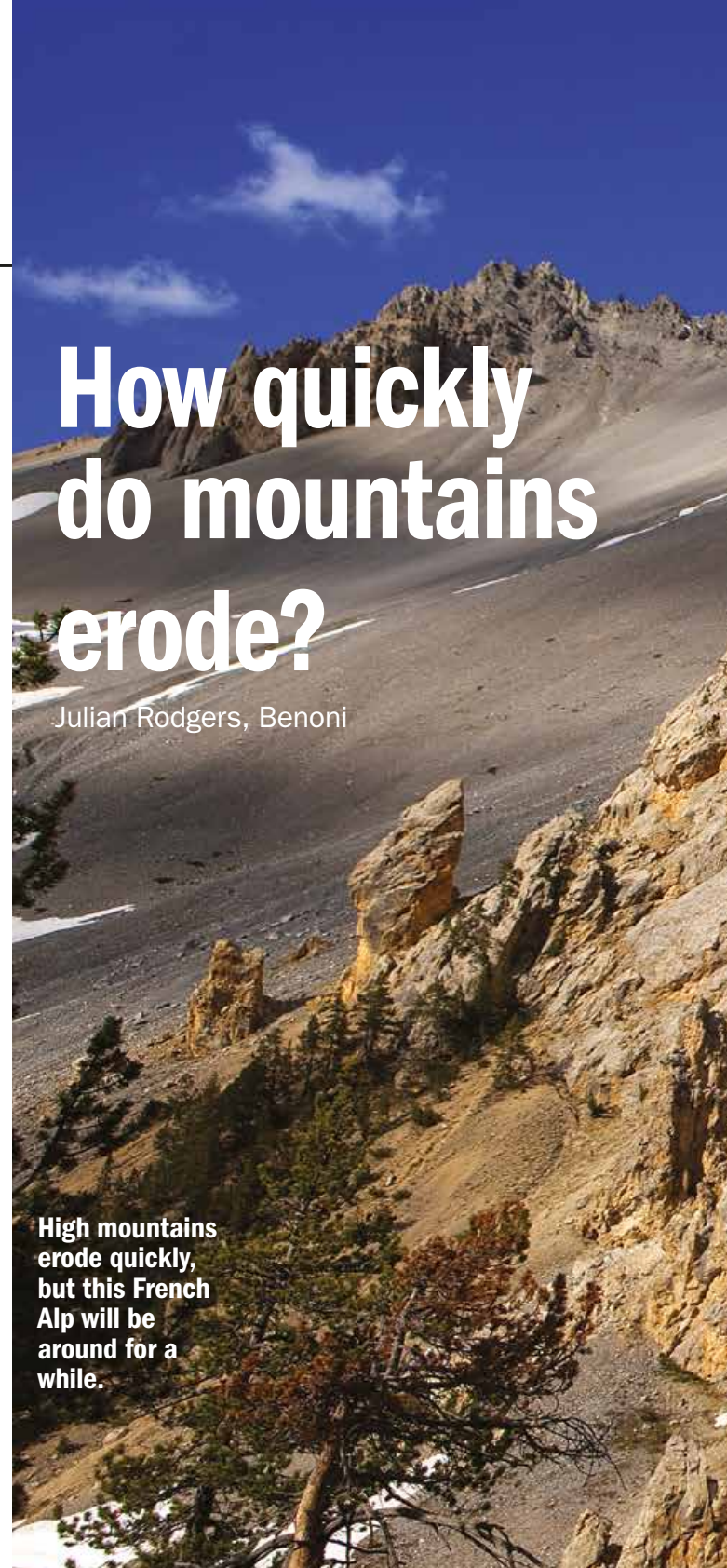
## Why does paper curl when it gets wet?

Bruno Arends, Hout Bay

**P**aper is made from pulp. This pulp comprises mainly of wood fibres and water. A sieve is used to extract water from the pulp. By doing this the larger fibres will sink more quickly to the bottom than the smaller ones. The larger fibres land at the back of the paper. These fibres will absorb the water when you throw a glass of water over a sheet of paper. The larger fibres swell more than the smaller ones. The back of the paper will expand more than the top and the sheet will curl. The fibres will remain in this position even after the paper is dry.

## How quickly do mountains erode?

Julian Rodgers, Benoni



High mountains erode quickly, but this French Alp will be around for a while.

## Is one bite enough for a mosquito?

Corrie van Marsberg, Paarl

**O**ne bite is normally enough for a mosquito, according to mosquito expert Bart Knols. But that's if you don't disturb her during her meal, like turning in your sleep, for example. If you do, the mosquito

will keep coming back for more until her belly is full. This is different when a mosquito is infected with the malaria parasite. The parasite has a trick to nest with more people. It produces saliva that contains less enzymes

to clot the blood. This makes it more difficult for the mosquito to suck the blood up. Now she will have to 'bite' more often to get more food. This way more people get infected with the disease.



### Q&A FLASH

- Only female mosquitoes bite. They need the blood for the production of eggs.
- Men are more often bitten than women.
- Pregnant women are more often bitten.
- Mosquitoes are more attracted to dark than light clothing.

## Why do some planets have water

**W**ater is a conduit between oxygen and hydrogen. These are 2 elements that are plentiful in the universe and react easily. There should be lots of water on planets in theory. This is partially true, but mostly in the form of water vapour, which is a gas. As far as we know, Earth is the only planet that has water in liquid form. This is because we have the right temperature and

pressure for liquid water. If Earth was a little closer or further away from the sun, it wouldn't have had any liquid water either. Too cold and the water freezes; too hot and the water evaporates without changing into rain. Also, the density or the pressure of the atmosphere is just too low for liquid water. The melted ice wouldn't change into liquid water, but water vapour instead. So, we're 'lucky'.





**T**here are 3 factors that determine the speed of erosion, says professor of tectonics, Sierd Cloetingh of the Vrije Universiteit in Amsterdam. Firstly, the nature of the stone: the more brittle, the faster the mountain will break down. Then the type of mountain: steeper and higher means faster erosion. The high French and Swiss Alps have eroded twice as fast as the lower Austrian mountains in the last million years.

The climate is another factor. Wind and rain will speed up the process. Big climate changes have an even stronger effect. We have had a few big Ice Ages in the last couple of million years. The French and Swiss Alps have decreased by about 1,000m because of this. Over 20 million years, the average is only about 400 to 500m per million years. We are not sure how long it takes for the whole mountain to disappear. Moving tectonic plates could push them up again.

## Is it possible to open the door of an aeroplane during the flight?

Kate Fourrie, Alberton

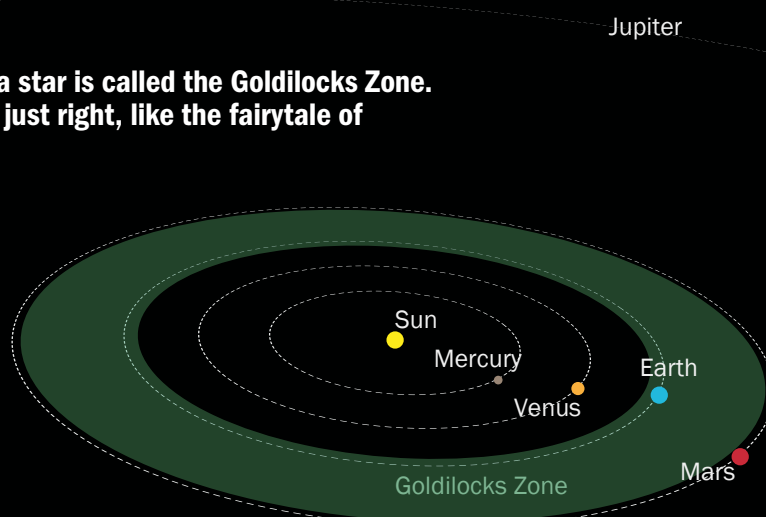


**E**ver worry when you are flying in a Boeing or Airbus that some drunken passenger is going to open the door at an altitude of 30,000 feet? These kinds of planes have a pressure cabin, says Joris Melkert, aeronautical expert at the TU Delft in Holland. The pressure is kept high so that everybody is comfortable and keeps on breathing. The door is being pushed out because of the different pressures between the sparse air at altitude. Most airplane doors open inward. Nobody would manage that during a flight, because it demands enormous power. Back on the ground the pressure inside the plane and outside is the same. One does need to be careful in small propelled planes though. They have no pressure cabin because they fly lower, so you would be able to open the door.

## and others don't? Marieke Sinnige, Harrysmith

The habitable zone around a star is called the Goldilocks Zone. Not too cold or too hot, but just right, like the fairytale of Goldilocks and the 3 bears.

The habitable zone of our solar system is measured between 0.95 and 1.37 astronomical units. One astronomical unit is 150 million kilometres, the average distance between Earth and the sun. Mars and Venus are outside the zone.



Inside our solar system we have discovered a few planets in the habitable zone. None of them have fluid water.

## Q&A **FLASH**

- The presence of liquid water is seen as a condition for (alien) life.
- In 2009, water was discovered in the form of ice on our moon.
- 70% of the Earth's surface is covered by water.
- 97% of all the water is in the oceans.





## Why do you bruise when you bump your knee, but get a bump on your head?

Amanda Potgieter, Johannesburg

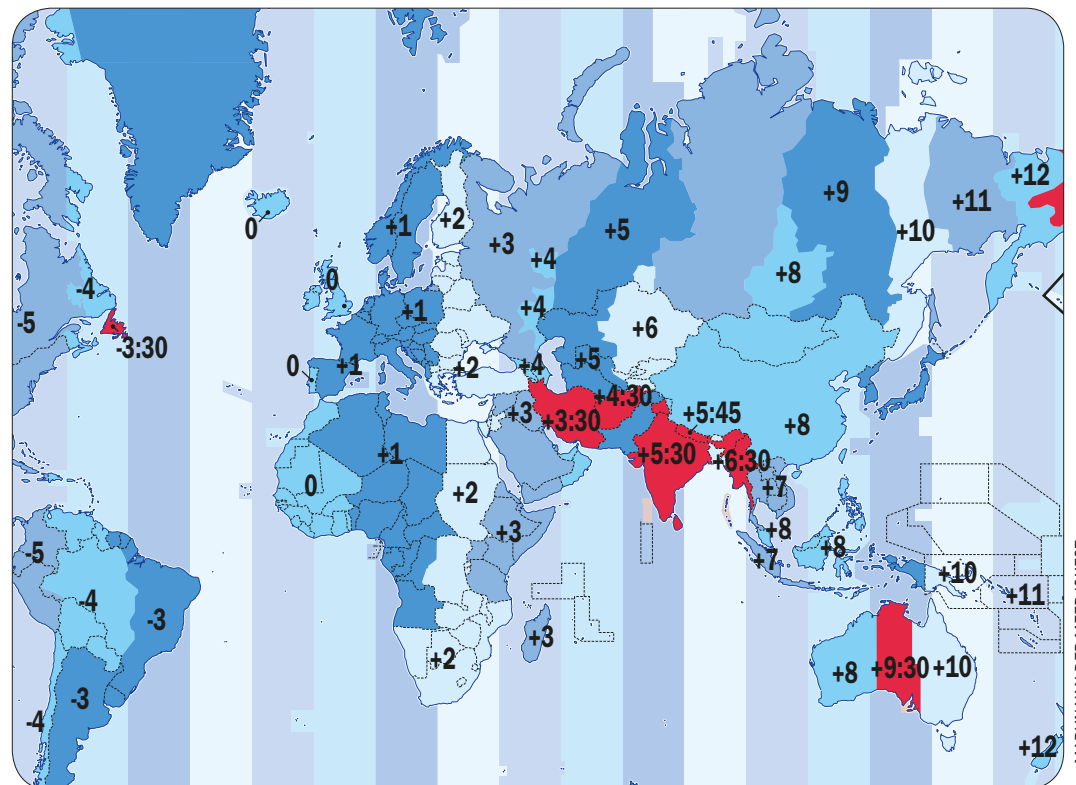
**B**umps and bruises have the same function. The blood vessels under the skin 'bleed' into your body when you hurt yourself. At most places in your body, the blood will go into the tissue around the spot. On your head this is a little more difficult: the skull is right under the skin so there is little space for blood. And so it will find another way: up. The skin will expand to make space for the blood and you get a bump. That said, a bruise anywhere on your body can also cause a rising of the skin.

## Is there a point on Earth where the 24 time zones come together?

Garth Vorster, Pretoria

**I**f all the time zones ran as straight lines that would certainly be the case, as all 24 lines would meet at both poles. However, the zones are divided per country and the lines only serve as more or less an indication. Only very large countries are divided into several time zones: Russia and the USA have 9, Canada has 6 and

Australia 3. Oddly enough, China has 1 time zone despite the large area it spans. There is no official time zone at the poles. Research centres that work on Antarctica use the time zone of the nearest city. Universal Standard Time (UTC), which is almost similar to Greenwich Mean Time (GMT), is used for research by pole explorers.



MARJIN VAN DER MEER/QUEST

## Can windmills be erected closer together?

Sean Potts, Kimberly

**T**echnically they can, however, the yield will be lower. It has been calculated that the optimum result for windmills will be reached when they are at least 10 blade lengths apart.



MISCHA KEUSER/HH





## Why do you have to pre-heat an oven?

Sabrina Manikkam, Johannesburg

**Y**ou pre-heat an oven to ensure that the dish remains at the same temperature during the cooking process. Pre-heating also makes it easy to select the optimal temperature because the time it takes to heat up one oven often differs from another. Also, different chemical processes take place at higher temperatures. A pizza will never get a crispy crust if you bake it at low temperatures. Even baking at low temperatures for the first few minutes can influence the end result. A cake or soufflé will never rise beautifully. With a stew or a vegetable dish, it doesn't make much difference. Just keep a watch on it till it's done.

SERGE KOZAK/CORBIS

## Why is there a serving suggestion on food packaging?

Ronel Pattenden, Durban

**P**ackaging is part of the marketing exercise. A good picture will move goods off the shelves fast. Manufacturers stick 'fresh fruit' on yoghurt and branches with olives and bright red tomatoes on tomato juice. Of course, these add-ons are not actually inside the packet. So, to prevent a possible lawsuit, it is clearly marked: serving suggestion. This means that the garnish is not inside the packet, but that it might be a good idea when serving.



ARENDA OOMEN/HH





SHUTTERSTOCK

## O&A FLASH

- A priest who hears confession is not allowed to report crimes to the police or tell them indirectly that he knows about criminal acts that have been confessed to him.
- Even the Pope confesses regularly. He chooses one of the Franciscan priests who have been appointed as confessors in the Vatican.
- A Catholic is supposed to confess at least once a year.

### Who hears the confession of a Catholic priest?

Tristan Marnees, Pretoria

**A** Catholic priest has his confession heard by another priest who has the authority to do so. Every Catholic can make a confession with a priest of his or her choice. However, not every priest has the authority to hear a

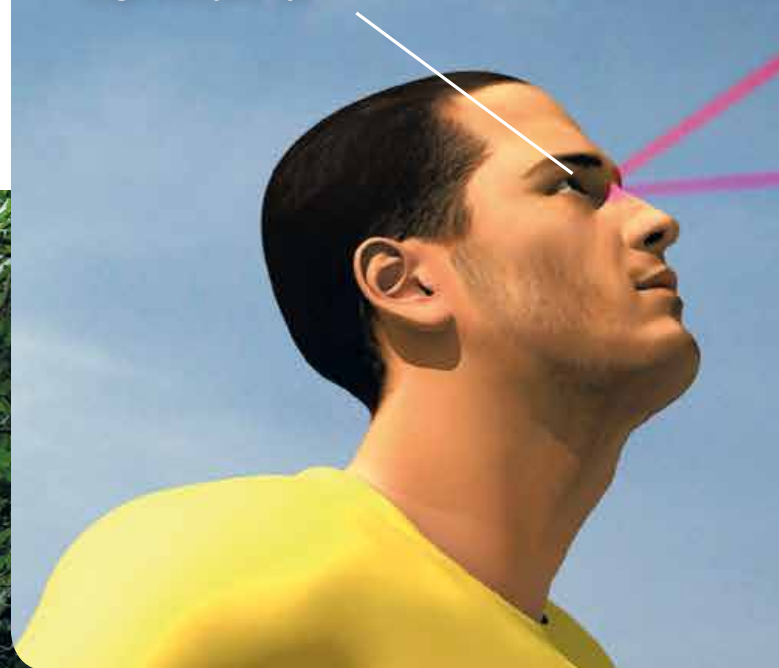
confession of another priest. Pastors, bishops, cardinals and popes have this authority because they have *ex officio* status. Other priests can be granted the same permission by the church. Also, priests don't have to confess

with someone in a higher rank. However, taking confession with a junior clergyman is discouraged and may only be done if another priest asks for it explicitly.

## What distance is a rainbow away from the person who sees it?

Nicolette Fourie, Pretoria

You will see all colours (red, orange, yellow, green, blue, indigo and violet) when you stand still, because they each enter under their own angle into your eye.



ROGER DOHMEN/HOLLANDSE HOOGTE



### Why do cats bury their poo?

Gina Hartoog, Centurion

**T**his is similar to the behaviour of their family members in the wild, such as tigers and lions. A cat is territorial and the way of presenting its faeces says something about its domination of a territory. If it does not bury its excrement, it is trying to say: "I am dominant here and

this is my territory, and even if that isn't so, it will be now." On the other hand, burying its poo means submission to the boss of this territory. Most house cats are trained to see their human owners as dominant. Pet cats bury their poo to make their submission clear.





## Rainbow

White solar light unites all colours of the rainbow.

The solar light breaks each colour in a slightly different direction when it enters a raindrop. The colours travel through the drop, resulting in the formation of a rainbow.

Red light is broken at an angle of 40 degrees with respect to the white light beam on the other side of the spectrum.

Violet light is broken at an angle of 42 degrees with respect to the white light beam on the other side of the spectrum.

**A** rainbow is not an object that is located at a certain place. Instead, it is light that is reflected by drops of water in the air. You can't touch a rainbow and you can't walk under it. Neither will you find a pot of gold at the end of a rainbow. The rainbow will 'move' as you walk towards it. So you can't tell where the rainbow is, only where the source of it is. When it is drops of a sprinkler then you can be quite accurate. With rain this is more difficult. It could be drops that fall right in front of you, but also drops that are located a few kilometres away.

Q&A **FLASH**

- You have to have your back towards the sun if you want to see a rainbow.
- A rainbow is actually a circle of which the bottom part has been extracted from your view by the Earth.
- You can see the whole circle from an aeroplane.
- You can see a bigger part of the rainbow if the sun is closer to the horizon.
- There are no rainbows when the sun is high in the sky. A possible rainbow will hide behind the horizon.
- A rainbow is smaller when raindrops are bigger, but the colours are more intense.

## What is the largest collection of anything in the world?

Lisa Jacobs, Durban

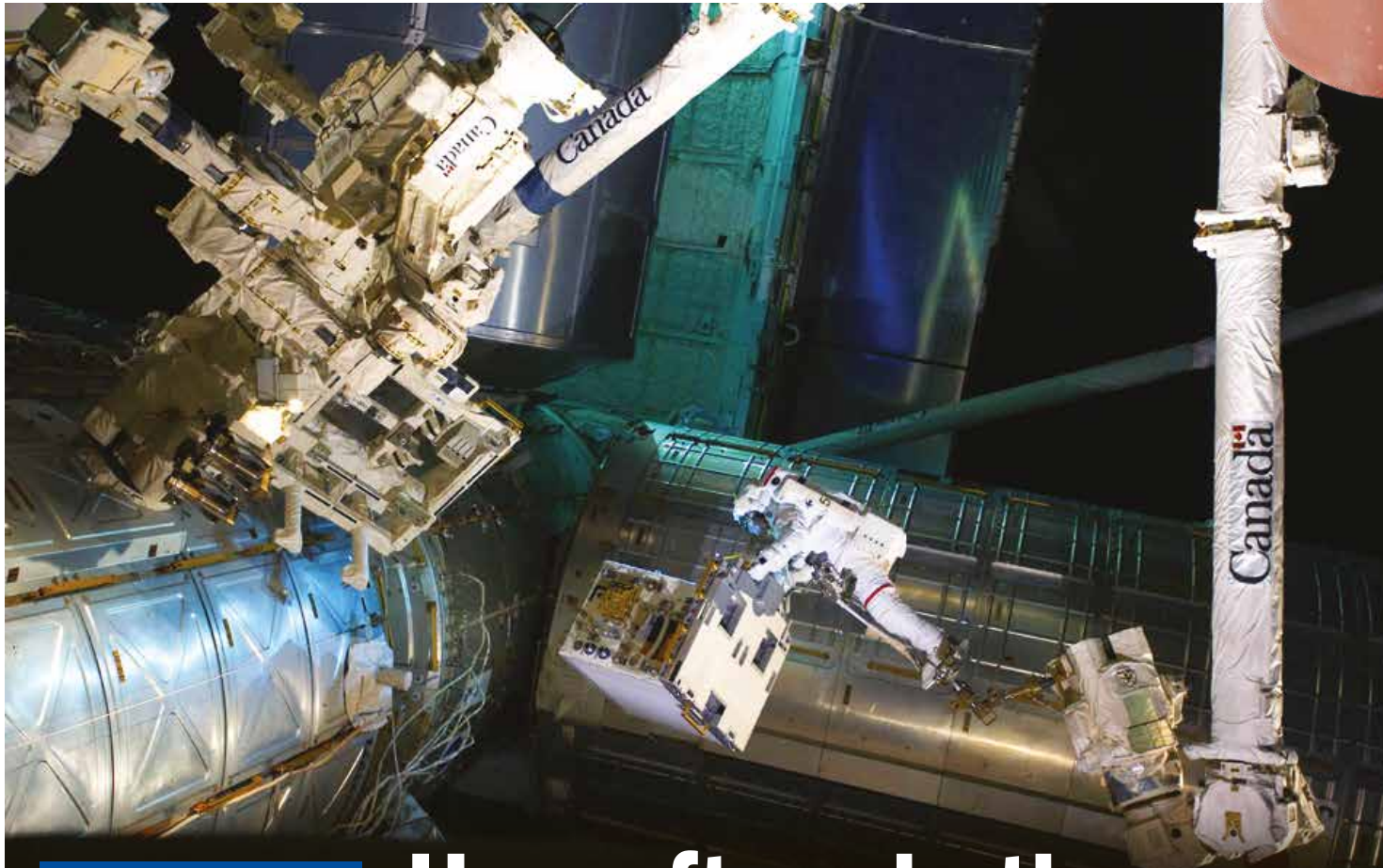
**I**f you include the museums and libraries then the Library of Congress, the national library of the United States, has the largest collection in the world. It contains 151.8 million items and there is an estimated 1,350km in bookshelves. The library houses more than 34.5 million books and magazines, 3.3 million records and CDs, 13.4 million photos, 5.4 million maps, 6.5 million pages of sheet music and 66.6 million manuscripts. And this information is already old news by the time you read this, because a new item is added every 4 seconds. The largest private collection probably belonged to deceased British postman Alan Roy. He left a collection of 2 million stamps after his death.

## Why does a record have 2 sides but a CD doesn't?

Zaf Khan, Pakistan

**T**his is because there is much more storage space on a CD. A maximum of 30 minutes of music fits on one side of a record. That is why 2 sides were needed to accommodate a normal music album that is generally an hour long. This changed when the CD was developed. Suddenly 80 minutes of music fitted and only one side was needed for an album. The other side could then be used for album artwork. Interestingly, there were 2-sided CDs but they were never popular.





These chocolates will make you sick before they make you drunk

**How many liqueur chocolates do you have to eat to go over the legal limit?**

Anna Thulsee,  
Bloemfontein

**T**he short answer: a whole lot. A liqueur chocolate only contains a few millilitres of liquor. However, each brand will have a different amount of liquor. But let's be positive, and say, 2mℓ a chocolate. A glass of liquor contains 40mℓ. This equals 20 chocolates. Two glasses of this drink will bring your blood alcohol content to about 0,5mℓ/100mℓ of blood. This is the max that is allowed. (That would mean that if you consume more than 40 liqueur chocolates you would no longer be allowed to drive. But by then you would probably already be sick to your stomach.)

## Q&A *FLASH*

- 30 years of space shuttles came to an end after the landing of Atlantis on 21 July 2011.
- The crew of the ISS see sunrise and sunset 16 times per day.
- The station is darkened at set times to keep the day/night rhythm.

## How often do they change the crew of the ISS?

Shannon-Lee Proctor, Johannesburg

**L**ife onboard the international space station is hard. You have to eat, work and sleep in zero-gravity, which is very tiring. The muscles of the crew are weakened by the lack of

gravity. The crew is changed every 6 months for this reason. The maximum stay is much shorter than the training. This takes at least 1.5 years.

SOURCE: NASA

## Why can't you travel faster than the speed of light?

Justin van Rensburg, Port Elizabeth

**T**o reach the speed of light will cost too much energy. You need energy to accelerate – the faster you

**No matter how fancy this rocket might be, it will not travel faster than the speed of light, according to Einstein.**

want to go the more energy you need. To reach a speed of 299,792,458m/s you will need an infinite amount of energy according to Einstein's theory of relativity. And that makes it impossible to travel at the speed of light or faster.







It seems a waste to not convert this energy into electricity.

## Is it possible to generate electricity by working out in a gym?

Jayson Dudley, Midrand

**Y**es, and this does happen. In fact, there are gyms in Europe that use fitness equipment to generate electricity. For example, a gym in The

Hague (NL) has a machine that when used for 10 hours per day yields about 2,000W of electricity. This is used to light 5 40W globes for 10 hours.

## Why are there pictures on my toilet paper?

Rick Kessels, Pretoria

**T**he simple answer is that it looks a bit nicer than just plain white toilet paper. It also makes

it more recognisable. If you are shopping for toilet paper, chances are that you will buy the same brand all the time and you usually recognise it by the pictures on the rolls.

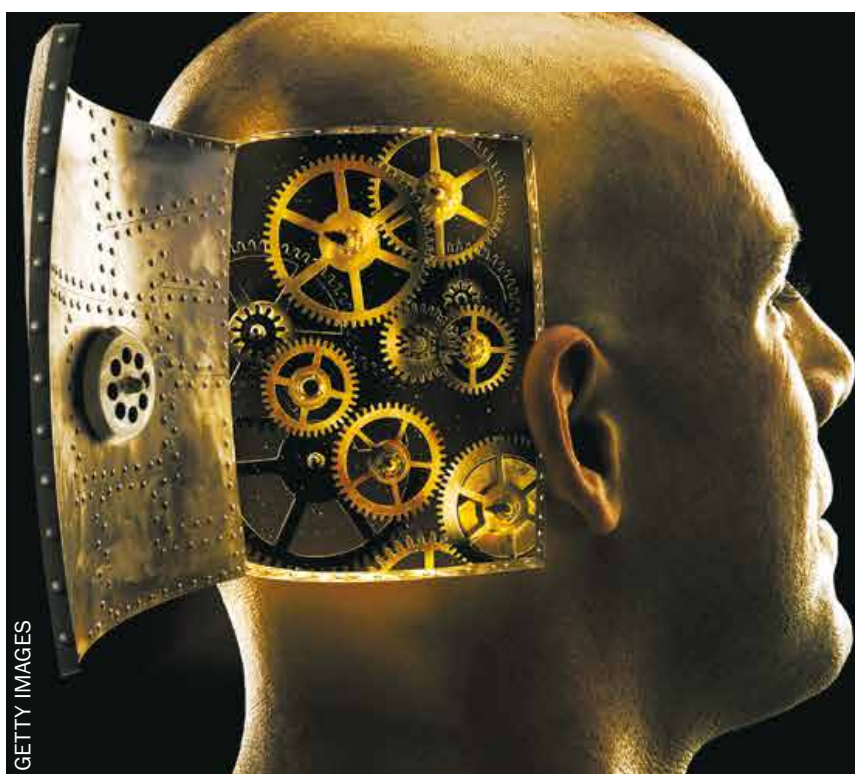
So let's see what you think of someone.



VINCENT VAN DEN HOOGEN/HH

### Q&A **FLASH**

- Apart from the well-known butterflies, flowers and dogs, you can also get toilet paper with Sudoku puzzles and the American flag.
- If you want, you can print your own designed toilet paper.
- Toilet paper featuring the face of Adolf Hitler was very popular among the Allies during WWII.



## What makes you an intellectual?

Dominique Drake, Grahamstown

**T**he term 'intellectual' is not well-defined. An intellectual usually has a high intelligence, a university education and is very capable of thinking and reasoning logically. An intellectual can excel in all fields, but the term is used more often with thinkers, especially in the fields of human sciences.

The adjective 'intellectual' refers to mental or spiritual capabilities.

### Q&A **FLASH**

- The word 'intellectual' gained popularity at the end of the 19th century during the Dreyfus affair.
- Alfred Dreyfus (1859-1935) was a French Jewish officer in the army who was accused of espionage. A group of authors, scientists and historians doubted his guilt and pleaded for a more fair justice system.
- The group was labelled 'intellectuals', of which the meaning varied from a swear word to today's meaning.



## Why do we like fizzy drinks?

Natasha van Zyl, Johannesburg

**T**he most obvious answer is that people like the tingling of bubbles on their tongues. In fact, this stimulates the same receptors in your mouth and nose as mustard. Furthermore, carbon dioxide also changes the taste, giving liquid a more bitter taste. In non-fizzy drinks, the taste is not evenly

distributed on your tongue. The result: your brain gets confused and interprets it that as a slightly bitter taste. Bubbles 'attract' flavours to themselves. When they explode, they emit a strong flavour concentration. This happens when you drink champagne, and probably also soft drinks.



DOUGLAS JOHNS/CORBIS

Q&A

### FLASH

- The bubbles in cool drinks are made from carbon. These occur when carbon dioxide is diluted in water.
- The bubbles in champagne are created by the fermenting of sugar in the bottle.
- Some natural springs also contain bubbles. The carbon gas rises while the water travels underground. The carbon that is released comes from the contact that the water makes with carbon in the rock layers.

## What time is New Year in space?

Avesh Singh, Randburg

**T**he crew of space stations, such as the International Space Station (ISS), celebrate their New Year more than once. The ISS orbits Earth 15.7 times per day and passes over the date-border several times. That said, the ISS sticks to an official time or it would be difficult to make appointments with flight control on Earth. The time on board is Greenwich Mean Time (GMT). South Africa is 2 hours ahead of GMT. So the official New Year in space is 2am our time.

RELAXIMAGES/CORBIS

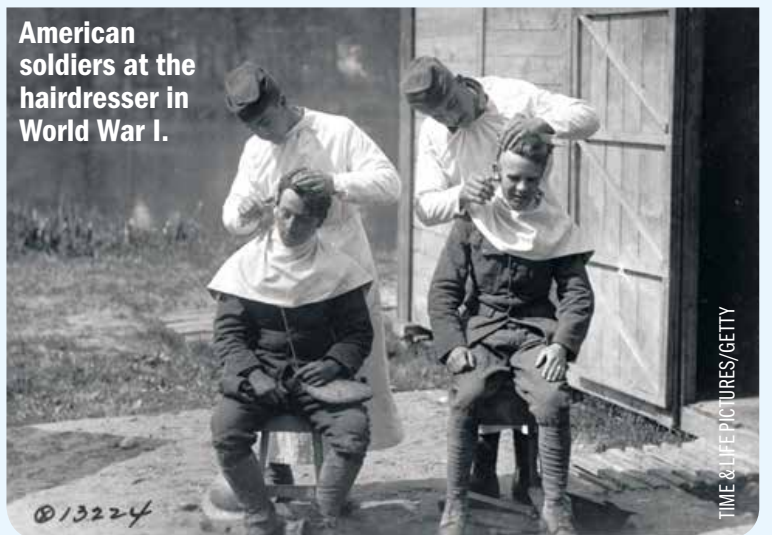
## When did it become fashionable for men to have short hair and women long hair?

Lorina Dirkson, Durban

**H**air styles are mainly dictated by culture. Long hair used to be a sign of health and status in the West. Greek gods and heroes are often depicted with long hair. Long hair was also popular among the upper class in the middle ages, since noblemen had enough time to maintain it. Also, they didn't have to work and worry about their hair getting in the way. Short hair

only became fashionable in Europe after WWI. All soldiers shaved their hair, or at least cut it very short, for practical reasons. Because all soldiers were seen as heroes, many ordinary civilians soon copied the short hair style. There are a few exceptions, however, such as hippies. What about women? The fairer sex has had long hair since the earliest paintings known of mankind.

American soldiers at the hairdresser in World War I.



TIME & LIFE PICTURES/GETTY



# Why do dolphins like to swim alongside boats?

Denver Hobbs, Durban

**D**olphins like to ride on the bow wave. This is the wave that forms at the bow of a boat when it moves through the water. You can compare this with surfers who ride a wave. A dolphin has the perfect shape, just like a surfboard, to be taken along on a surf wave. They don't do this to get to their destination quicker. They just want to have fun. They use the speed of the wave to make jumps and tumbles. The dolphins will alternate places for the best spot on the wave when they are in a pod.



INGO ARNDT/MINDEN PICTURES/GETTY

## Do insects feel cold?

Emma Petersen, Johannesburg

**W**hether insects get an uncomfortable feeling from cold weather is unclear. Their nervous systems are probably not complex enough for that. However, they will in any case try to avoid the cold as well as extreme heat. Insects are able to register hot and cold temperatures. They will look for a spot in the sun when it is cold and a spot in the shade when it is hot. This is very important as insects are cold-blooded and not able to produce heat on their own. They are just as hot or cold as their surroundings. They are slow and move as little as possible when they are

### Q&A **FLASH**

- Cold-blooded insects need less food. That's because they don't need energy to keep themselves warm.
- Bees are cold-blooded but are able to generate warmth themselves by vibrating their wing muscles.
- Honey bees lower the temperature of their hives by fanning cooler air inside.

cold. They need warmth to become more active.

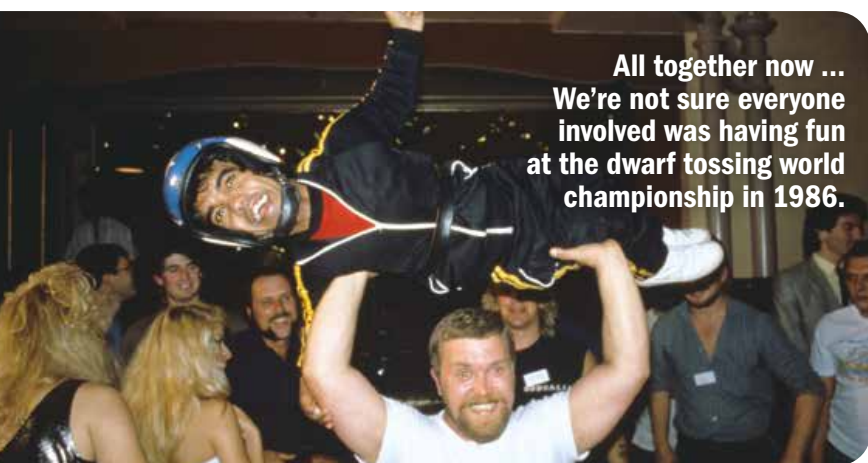


## Some truly bizarre sports have come and gone over the centuries

# END of exercise

*Some sports we know only from books or movies; they died an early death. Why don't we play them anymore? Were they too complicated, too violent, too humiliating and inhuman or simply impractical?*

■ TEXT: ANTJE VELD



### Dwarf tossing

**Played where and when?** Dwarf tossing aka dwarf throwing was popular in the '80s and '90s of the 20th century. It was played in Australia, New Zealand, Canada, the USA, France and England.

**The rules?** People, who are shorter than 1.45 metres, dress in protective gear. Then someone throws them as far as possible – usually onto mattresses or some other soft spot. The person who throws the dwarf the furthest wins. The sport was particularly popular in bars. In 1986, a world championship was held. The team from England won.

**Downfall?** In the early '90s, the French Council of State (legal advisor to the government) started questioning the sport. Isn't it an attack on human dignity? He wanted to ban dwarf tossing. But Manual Wackenheim, at 1.14 metres tall, opposes the ban. He earns his living as a projectile and insists on his right to work. The judiciary agrees. The case draws a lot of attention. In the US, the Little People of America movement opposes dwarf tossing. In 2002, the UN ends the discussion: they declare dwarf tossing inhuman and put a stop to it. Completely.

**What else?** An alternative to dwarf tossing is dwarf bowling. The little person wears protective gear with a handle on the back. In the process, he's transformed into something like a bowling ball. Put him on a skateboard and he's pushed towards small bowling pins down an improvised bowling alley. Unsurprisingly, this sport has also been banned.



### Gladiator fights

**Played where and when?** Mainly in ancient Roman times. The first mention of an organised gladiator fight is in the year 264BC. How did the Romans come up with the idea? Good question, with loads of potential answers. Most likely, it's an adaptation of one of the funeral rites of the Etruscians. This nation lived in parts of current-day Italy around the 9th century BC and honoured their forefathers through fights.

**The rules?** Fights are organised by consuls, emperors and other people in power to celebrate military victories, holidays or anniversaries. The show opens with wild animals and the execution of criminals. The main attraction follows: gladiator fights. Two gladiators with the same types of weapons, strength and experience

face each other. The fight only ends if one kills the other. If they both get so tired they can't continue, the referee asks the public which one should win. They cheer their hearts out for the life or death of their favourite. Though it's ultimately the emperor who decides who dies. **Downfall?** Rome suffered an economic crisis from about the 3rd century AD. This made it virtually impossible financially to organise the expensive games. Plus the increasing number of

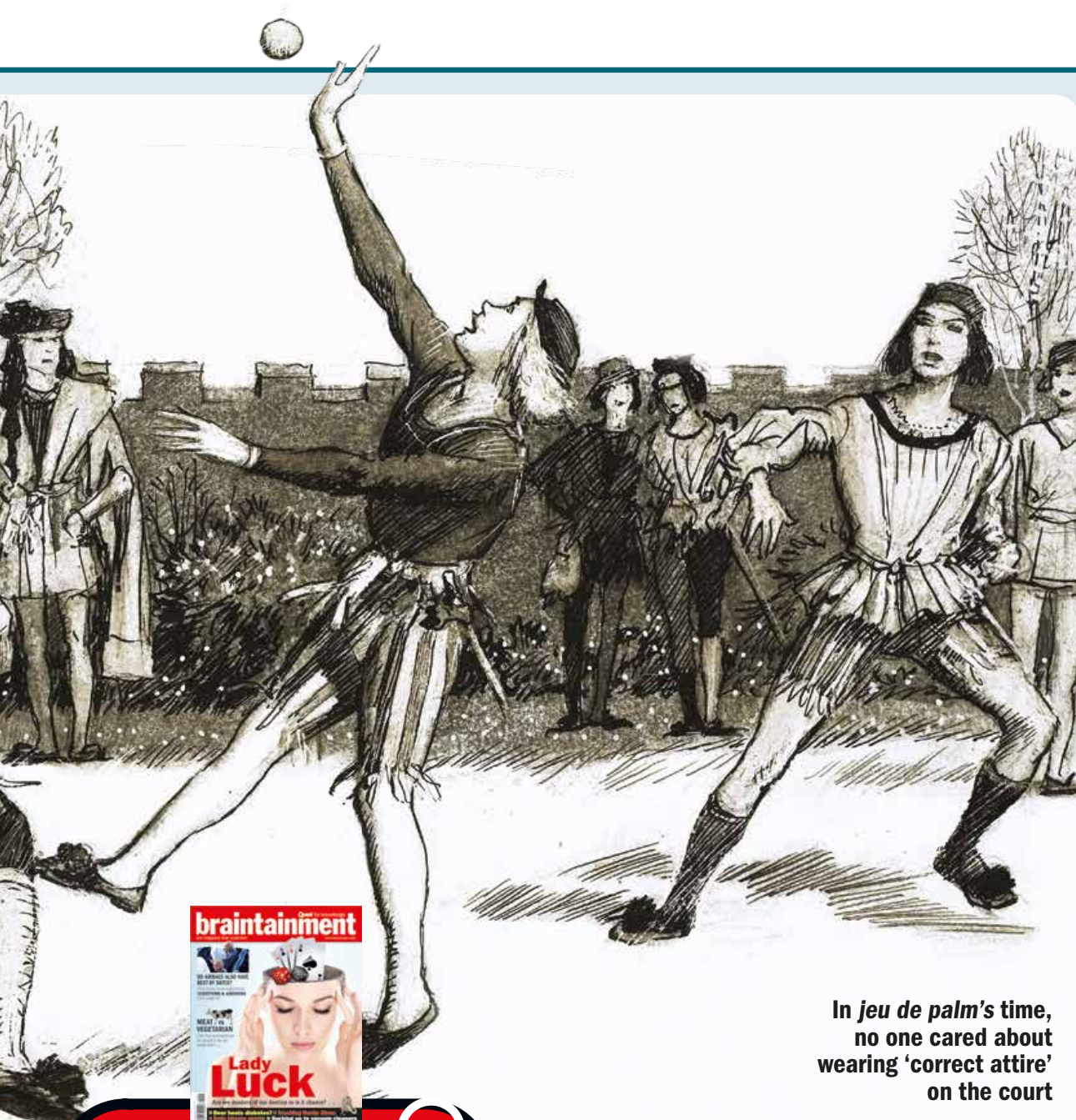
Christians in society had issues with the sport. Only in the 6th century AD are the games officially banned.

**What else?** Gladiators were generally slaves or criminals. Later, 'normal citizens' also took part, of their own free will. They find it honourable to fight. To delay their death as long as possible, gladiators are trained in special gladiator schools.

**The Romans just lurved their fights.**







## Palm tennis

**Played where and when?** *Jeu de palme*, to give it its real name, started in France. *Jeu de palme* literally means 'game played with the palm of the hand'. From the 11th century it was played – fanatically – by mere mortals and monks.

**The rules?** *Jeu de palme* is a fore-runner of modern-day tennis, with a dash of squash added. Two players hit a ball to and fro across a field. Point allocations are the same as those in tennis. That's pretty much where the similarity ends. The ball was originally hit with the hand of the player. The field was surrounded by at least 3 walls – one behind each player, plus one side wall. The first ball always has to end up in the opponent's section. After that, the game has far more rules than tennis. For instance, a ball may bounce twice in certain instances without the loss of a point, and service doesn't automatically change after a game ends. You have to win back service by scoring a point.

**Downfall?** In the 14th century, the sport becomes a particular favourite of royalty and the king. They introduce rackets, which the common public cannot afford. Around 1800, the sport develops into what we now know as tennis.

**What else?** *Jeu de palme* was played – once only – at the Olympic Games. In 1908. But it was played with rackets, not palms.

In *jeu de palm's* time, no one cared about wearing 'correct attire' on the court

**Curious?**

[braintainment.co.za/issue2](http://braintainment.co.za/issue2)

## Running on water

**Played where and when?** The extraordinary sport was practiced in the 17th and 18th centuries. This was mainly aboard various trade ships belonging to the VOC fleet (Vereenigde Oost-Indische Compagnie aka Dutch East Indies Company).

**The rules?** The ships of the VOC traverse the world. But their ability to travel is tied to the wind. Sometimes it happens that ships stand still, either due to wind from the wrong direction, or simply due to a complete lack of wind. To keep the crews occupied, captains organise onboard sports tournaments. The sailors have, for instance, to complete a course running with a bag of flour around their necks. The grand prize? The fastest runner wins a piece of fruit or an extra tot of alcohol.

**Downfall?** Towards the end of the 18th century, the VOC's fortunes take a turn for the worse. Wars and



A VOC ship also doubled up as an athletics field.

competition with other countries lead to the trade organisation's financial downfall. In 1798, it is disbanded. No more ships sail for trade, so no more onboard games. Who knows, though, maybe today's sailors still play games like this?

**What else?** The VOC didn't just trade with pepper, cinnamon, coffee and tea. They also did a brisk trade in elephants. The going price for this beautiful beast was 6,000 to 7,000 guilders (about R30,000, excluding inflation).

## Born! A new sport

**W**hile sports may die out, new forms of competition are forever evolving. Since 2000, for instance, we've had mobile phone throwing. It's a sport in which participants throw mobile phones and are judged on distance or technique. There are usually 4 categories in the sport. Original (also called 'Traditional') is an over-the-shoulder throw. The farthest distance (best of 3) wins. Freestyle contestants get points for aesthetics and creative choreography. Like doing a handstand while throwing the phone. There are also Team and Junior categories. Any phone that weighs over 220 grams is acceptable. Sometimes event organisers provide phones. Jeremy Gallop is SA's top mobile phone thrower. He won the last 3 UK championships (2008, 2009 and 2010). He also holds the South African record at 92.06 metres, set in 2007. Events are often sponsored by phone manufacturers and recycling companies. [Source: Wikipedia]



SOURCES: DE KLOTEN VAN DE KEIZER, HEIN MEIJERS, CONTACT (2010), GLADIATOREN, FIK MEIJER, ATHENAEUM – POLAK&VAN GENNEP (2004), SPORTGESCHIEDENIS.NL, [HTTP://TINYURL.COM/66LA8E](http://TINYURL.COM/66LA8E), SMITHSONIAN.COM, [HTTP://TINYURL.COM/5VZSJM5](http://TINYURL.COM/5VZSJM5), WIKIPEDIA.COM.



How did a gas cloud become an entire solar system?

# Earth's journey

*For all we know it's always been there. However, Earth has, in fact, only existed for around 4.56 billion years. Our planet did not exist for the first 9 billion years after the Big Bang. How did it become the planet we know today?*

■ TEXT: ELLY POSTHUMUS





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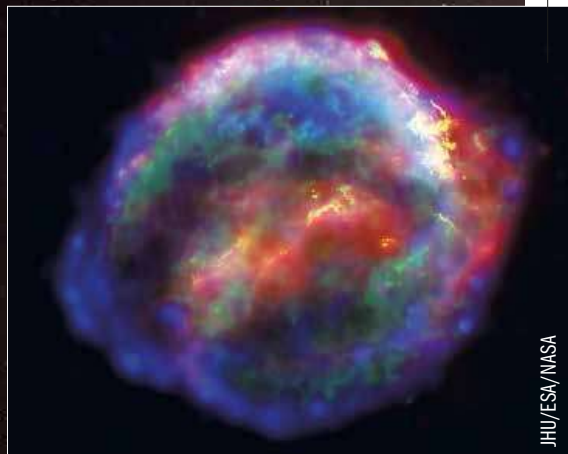




# The sun, Earth and other planets floated through space as tiny particles in a big cloud

## Everything is star matter

Our planet consists of numerous heavy elements such iron and oxide. These elements arose once in stars. The core of a star changes hydrogen, which has its origin in the Big Bang, into other elements. Fusion makes this possible, by fusing the cores of atoms. From here, other heavier elements arise. Hydrogen is mainly converted into helium in stars. A lot of energy is released in this process. Hydrogen depletes as the stars age. Big stars can convert helium into oxygen and carbon. These elements can melt together to form even heavier elements in even bigger stars. When these old, enormous stars explode at the end of their life, even heavier elements arise. Everything is then thrown into space during such an explosion or supernova. New stars and planets can arise from this floating matter.



Astronomers suddenly saw this star in space in 1604. We now know that these are the remains of a supernova, an exploded star. A new star will arise from this matter only in the distant future.

**M**atter and gas has floated through space in clouds for about 5 billion years. About 98% of these clouds are made up of hydrogen and helium, which are the lightest elements around. These were formed during the Big Bang. In addition, particles measuring less than a micrometre float in between these gases. These particles contain heavier elements, such as carbon, oxygen, iron and aluminium. These are the building blocks of Earth-like planets. How did this primal mist of matter and gas become the birth chamber of Earth?

### ● A cloud becomes a star

Such a cloud is an unstable balance between gas pressure in the cloud that pushes the gas and matter particles apart, and gravity, which pulls the particles together. Sometimes, gravity wins. According to Carsten Dominik, a professor of astronomy at the University of Amsterdam (NL), this could happen when a cloud cools and the gas pressure diminishes. "This could also happen when a shockwave emitted from a nearby exploding star disturbs the cloud," he added. The

result is that the cloud implodes. This is what happened to our primal mist about 4.6 billion years ago. Gravity became stronger and pulled the material in the cloud closer together. The gravitational force transformed into kinetic energy and the gas particles started moving faster, and naturally, also became warmer. A star arose in the middle. For us, this was the sun. The temperature in the middle of the star rose to millions of degrees. Atomic fusion occurred in the enormous heat and the new star also produced energy.

### ● Turning creates a disc

Not all the material of the cloud formed a star. This primal mist was also starting to rotate, spinning faster as the cloud collapsed. "Compare this to a skater who performs a pirouette on the ice. When she pulls her arms around her, she will spin even faster," explained Dominik. "Centrifugal forces were created by the rotation, which pushed out the gas and matter perpendicularly on to the axis. A flat disc of matter appeared around the star, much like pizza dough that is spun around. Most of the material of the original cloud

matter disappeared into the star from this so-called 'protoplanetary disc'. But the matter and gas further away from the star did not rotate fast enough to fall into it. About 1 to 10% of the primal mist orbited around the star instead.

### ● A collision makes lumps

The shaping of the star and its associated gas and disc matter took about a million years. At that stage, there were still no planets, but their birth would happen soon. "All the tiny matter particles in the disc rotated in the same direction around the sun. If all particles orbited neatly around the star, nothing would happen," explained Dominik. "But sometimes, the particles moved up or down in their orbits, and collided with each other. This happened at such a low speed that the 2 particles simply stuck together. These fragments slowly grew in size from a millimetre to a centimetre. These little lumps eventually grew to large chunks, known as planetesimals. These are the small bodies from which a planet originates in the early stages of development of a solar system. Exactly how that works is still a mystery."

## Giant birth

Our solar system doesn't only have Earth-like planets but also the gaseous giants Jupiter and Saturn. It is not certain how these planets were formed. The genesis of a gaseous giant is probably the same as that of Earth and other terrestrial planets. Matter particles with heavier elements clumped together to form a large ball. No gas was present then. Gravity became stronger as the planet increased in size. When the planet grew large enough, about 10 times the mass of Earth, the gravity was enough for the celestial body to not only attract solid particles, but also gas. Hence, the gaseous planets have a rock core, but the largest part of the mass consists of gaseous hydrogen and helium.





## Know your neighbours

**O**ur solar system has 8 planets. Here are some interesting facts about our planetary neighbours:

■ Mercury, Venus, Earth and Mars are Earth-like or terrestrial planets. They have a solid surface. Jupiter and Saturn are known as gaseous giants, as their surfaces consist mainly of gas. Uranus and Neptune are ice giants. The outer layer of these planets consists of evaporated water, methane and ammonia.

■ Jupiter is the largest and heaviest planet of our solar system. It has a diameter of 143,884km and its mass is 318 times greater than that of Earth. It is heavier than all the planets in the solar system put together.

■ Mercury is the smallest planet of our solar system, with a diameter of 4,878km.

■ The temperature on Uranus is  $-224^{\circ}\text{C}$ , making it the coldest planet in our solar system.

■ Venus is the hottest planet, with an average temperature of  $480^{\circ}\text{C}$ .

Many areas in space have been discovered where stars are born. It only takes 50 million years before a cloud of matter changes into a star with a few planets.

### ● The globe warms up

In the case of Earth, all the matter particles were absorbed into planetesimals after about 10 million years. They only began to take on a round shape once they were a few thousand kilometres in size. According to Dominik, gravity pulled the mass into a round shape. It was as if the force that arose from the middle of the planet in the making pulled everything towards itself, and the round shape formed because only in this shape could all the mass be as close to the centre as possible. It took about 30 million years before these chunks formed a planet the size of Earth. Many collisions took place during this time. A lot of energy was released every time planetesimals crashed on the

1. The original matter and gas cloud.

2. The cloud collapses and becomes a protoplanetary disc with a denser and warmer centre.

3. Thick clumps arise around the hot centre. These are called planetesimals.

4. The planetesimals have grown to round planets.

## Radioactive clock

**W**e can determine the age of rocks on Earth and of meteorites by looking at their radioactive elements. These change over the course of time into other varieties of such an element or into other elements. The radioactive element rubidium-87, for example, changes to the element strontium-87. Rubidium-87 has a half life of about 49 billion years. This means that after this time, half of the original rubidium-87 is converted to strontium-87. Scientists can calculate how old a piece of rock is by looking at the ratio between the various elements in the object.



## The Earth and the moon thank their existence to cosmic violence caused by collision of 2 planets

### Layer of air

**W**e need oxygen to live. Fortunately, there is quite a bit of this gas in our atmosphere. But this wasn't always the case. An atmosphere is nothing more than a gas-like layer around a planet. The composition of this gas layer has changed quite a bit since the birth of Earth. Our planet was very hot in the early days. The gas layer around Earth probably consisted mainly of helium and hydrogen. The disc matter from which Earth originated was full of this gas. However, these molecules moved so fast because of the heat, that they escaped the Earth's gravity. Our planet blew out all

sorts of volcanic gases, such as steam (water), carbon dioxide and ammonia, when it cooled down. The ammonia molecules split into hydrogen and nitrogen under the influence of sunlight. Oceans appeared at this time too. Bacterial life then emerged, transforming carbon dioxide into oxygen with the aid of sunlight. The bacteria breathed oxygen in our atmosphere.

▶ ever-growing young Earth. Our planet eventually became so hot that it became fluid. This caused all the heavy elements such as iron and nickel to sink into the centre of Earth under the influence of gravity. Lighter materials, such as oxygen, aluminium and silica, ended up on the surface. Even more heat was released during the friction caused by sinking iron.

### ● Birth of the moon

Various planets arose around our large star. Earth was finally able to rest and cool down when the majority of iron had landed in the core and the number of crashes decreased. But this rest was significantly disturbed one more time. About 4.53 billion years ago, when Earth was nearly 'completed', it collided with a planet the size of Mars. About 10% of the mass of our planet and the creation of the moon can be attributed to this collision. How do we know about this

incident? The composition of the moon indicates this. It contains a lot less iron than Earth, which according to Dominik, is quite peculiar. "The moon and the Earth are neighbours. The composition of planets and moons depends on the composition of the disc matter from which they originate. Hence the moon's composition should mirror that of Earth," he stated. Astronomers link the lack of iron in the moon with this huge collision. This took place after the iron had already sunk into the core of both crashing planets. That is why only the lightest outer layer of the planets flew through space. The ejected debris landed in a disc around the Earth. The same thing that happened to the sun was repeated in this disc. The twirling matter and debris then merged. This formed the moon, without iron. The rest of the planet with the iron core melted together to become Earth.



ESO

GARY HINCKS/SPL/ANP



## Old rubble

**W**e know roughly how old the Earth and our solar system are, thanks to asteroids. Asteroids are small rocks that escape gravity during planet formation. They originate just like planets do, through the gathering of particles that orbit the young sun. Such an asteroid falls to Earth as a meteor occasionally. These chondrites give scientists a chance to study the origins of our solar system. That's because these little

rock fragments have never melted and still have the exact composition they had during the formation of our solar system. The oldest of these rock fragments are 4.56 billion years old. And because they appeared at the same time as Earth, we know that the Earth has to be the same age.

### ● Crust becomes soil

Earth cooled off yet more and the crust could finally cure forever after this last huge collision. This paved the way for the creation of oceans. According to Dominik, the surface of a planet has to be solid to retain fluid water. "The temperature of the Earth's crust has to be less than 100° C or the water will evaporate," he added. It is not known when the Earth had cooled off enough to begin looking the way it does today. Researchers of the McGill University in Canada claim that they have found the oldest rock, believed to be 4.28 billion years old. This implies the Earth's crust would have cured for around 280 million years after its birth. However, other researchers doubt the carbon dating method the Canadians used, and think that the oldest rocks are about 3.8 billion years old. They also think that the crust of our planet only solidified about 760 million years ago.

### ● Earth is not alone

Was the birth of Earth and our neighbouring planets a special event? Not really. Our planet is not the only one to arise from clumps of matter around a young star. All rocky planets were born this way. "Planets possibly grow around each star," added Dominik. "There's a strong chance that there are many more planets than stars. There are also possibly stars without a planet, but there are also many stars with more than one planet. Furthermore, new stars are born constantly. So the formation of planets is ongoing. More and more planets are being born all the time. Already in our galaxy, there are around 200 billion stars. So there has to be many more planets," he concluded. ■

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HOLLANDE HOOGTE

A small piece of the Sichte-Alin meteorite, which exploded above the Soviet Union on 12 February 1947.

## Where does the water come from?

**71**% of the surface of Earth is covered with water. There are 2 theories about how the water came to be. One theory claims that the water comes from the original building blocks of Earth. The young Earth already had water during the warming at its birth. This landed in the early atmosphere and gravity kept it in place. The water condensed when Earth cooled off and the oceans arose. Another theory is that most of the water that Earth created during its formation escaped into the atmosphere. The water would then have arrived later via comet, after Earth had already cooled off.

From left to right: A planet the size of Mars crashed against Earth about 4.53 billion years ago. Debris of the outer layers of both celestial bodies was flung away. The debris landed in an orbit around Earth and clumped together to become the moon.



### EXTRA INFO

<http://exoplanet.eu>: a website with all (up till now) discovered planets in a row.  
[Tinyurl.com/aardeterwereld](http://Tinyurl.com/aardeterwereld): An animated documentary about the birth of our planet.



## When will the dream trip to the Red Planet finally be made?

# Cowboys to Mars

*A manned expedition to Mars is extremely expensive and very complex. Still, there are companies that think they can undertake this job. Should we just believe them?*

■ TEXT: MARK TRAA

**A** remarkable press conference took place at the National Press Club in Washington DC in October 1985. A travel agency from Seattle and rocket builder from Redwood City in California made their great plans public. People would from now on be able to buy tickets for a very special voyage: a trip through space. Two rockets, each with 20 people on board, would be specially built for this.

The tickets would cost \$50,000 each, it was announced. A deposit of \$5,000 could be made now. The tourist trips to the cosmos would begin in 1992. Alas, it didn't happen. The accident with space shuttle Challenger in January 1986 halted American space technology for a few years. But even if that hadn't happened, a rocket with tourists in it would not have departed in 1992. Simply because at the time of the announcement no start had been made on the rocket: there were only beautiful drawings in shiny pamphlets. Anybody with a bit of savvy should have known that a totally new manned spaceship could never be built from scratch within 7 years. Still, there were people who put deposits down. And this

**The State Lottery promised a space trip as main prize on a television show in 2002. Marc Klein Essink presented *The Big Mission*. The programme was stopped when it became apparent that space tourism was not going to happen for a while.**



Mars has been used as a stage for many films. Here is a scene from the movie *Red Planet* (2006).

is how it has always been with companies that offer trips to the cosmos. Trips are offered at short notice because, of course, nobody will make a deposit for a holiday in 20 years' time. But the promised deadline is never made. And still there are always people who love to pull money out of their wallets. The prospect of making a space trip is apparently irresistible.

### ● State Lottery also fooled

And this was apparent again in 2001. The State Lottery announced a new, spectacular main prize: a space trip. This was going to be given away by Marc Klein Essink on the TV show *The Big Mission*. The winner would orbit around Earth a few times in 2003. Apparently nobody at the State Lottery had bothered to check if the necessary spaceship was already functional. It



ANP





wasn't – and to date it is still not. Test flights have been made with prototypes, but the first space tourists in their cosmic flight have still not left. *The Big Mission* was stopped eventually, because of 'stagnant development' in space. The big problem is that manned space flights are so expensive and need so much preparation time that almost no company can afford the investment. For now it is only governments that can do this. And they already have enough trouble maintaining a space station with a handful of crew (ISS).

#### ● One-way trip to Mars

The optimism of companies and private individuals to 'quickly' build a spaceship and earn money with ticket sales is unlimited. It isn't even about orbiting Earth anymore. There is a lot of commotion about Mars One, a plan to

## Old fantasies

A trip to space for ordinary people? We already wanted that when we had not even started the space race. The 3 gentlemen who science fiction author Jules Verne sent to the moon in 1865 were not exactly seasoned astronauts. Same goes for Tintin, Snowy, Captain Haddock and Professor Calculus, who landed on the moon in the comic strip book *Explorers on the Moon* in the mid-1950s. When we finally started talking about space trips, future fantasies became abundant. Cartoons appeared

in newspapers with hotels orbiting around Earth and the moon. In the '60s and '70s everybody expected that by now, at the start of the 21st century, we would have a booming space tourism industry. But the only tourists who have been in space so far paid millions for a week in the Russian space station Mir, and later in the ISS. You can't call them 'ordinary' people. The dreams about cosmic holidays have remained for everybody. In 1998 even Hilton made plans for a hotel with 5,000 rooms on the



moon. You may have to wait to make bookings though, because we haven't heard anything since.



# Whoever says that he can quickly organise a cheap flight to the cosmos is cheating you all

► send people to Mars from 2024. Please note: one way. The 4 crew members (2 men and 2 women) of this first mission would be quartermasters of a real permanent base on the Red Planet. Because there is no return option (saves fuel and thus money), the crew members will die there eventually. But hey, they would have had the trip of a lifetime and will go down in the history books as the first residents of Mars.

Mars One is a Dutch project. Space explorers Bas Lansdorp and Arno Wielders presented their plan in 2012. Since then a lot of questions have been raised. Is it, for example, ethical to send people on a 'suicide mission'?

Thousands of people from all over the world see no problem: they have already signed up. This year still, 6 teams each consisting of 4 persons will be put together.

## ● Lots to do still

And then? Then they go to Mars. With what? They still need a launch rocket. And a spaceship in which the crew will travel to Mars. And a device to land with

on the planet. Mars One has not signed definite contracts for all of this, excluding some exploratory studies. And this while the first people have to be on their way in less than 10 years.

That's not all. In the run-up to the mission of 2024 a lot still has to happen. An unmanned lander has to go to Mars in 2018, like a dress rehearsal. Also, a satellite has to go there to ensure communication between Earth and the Mars colony. Then they need 2 robot cars, and 6 freight flights with living-quarter units and supplies. For good measure: they still have to be put together.

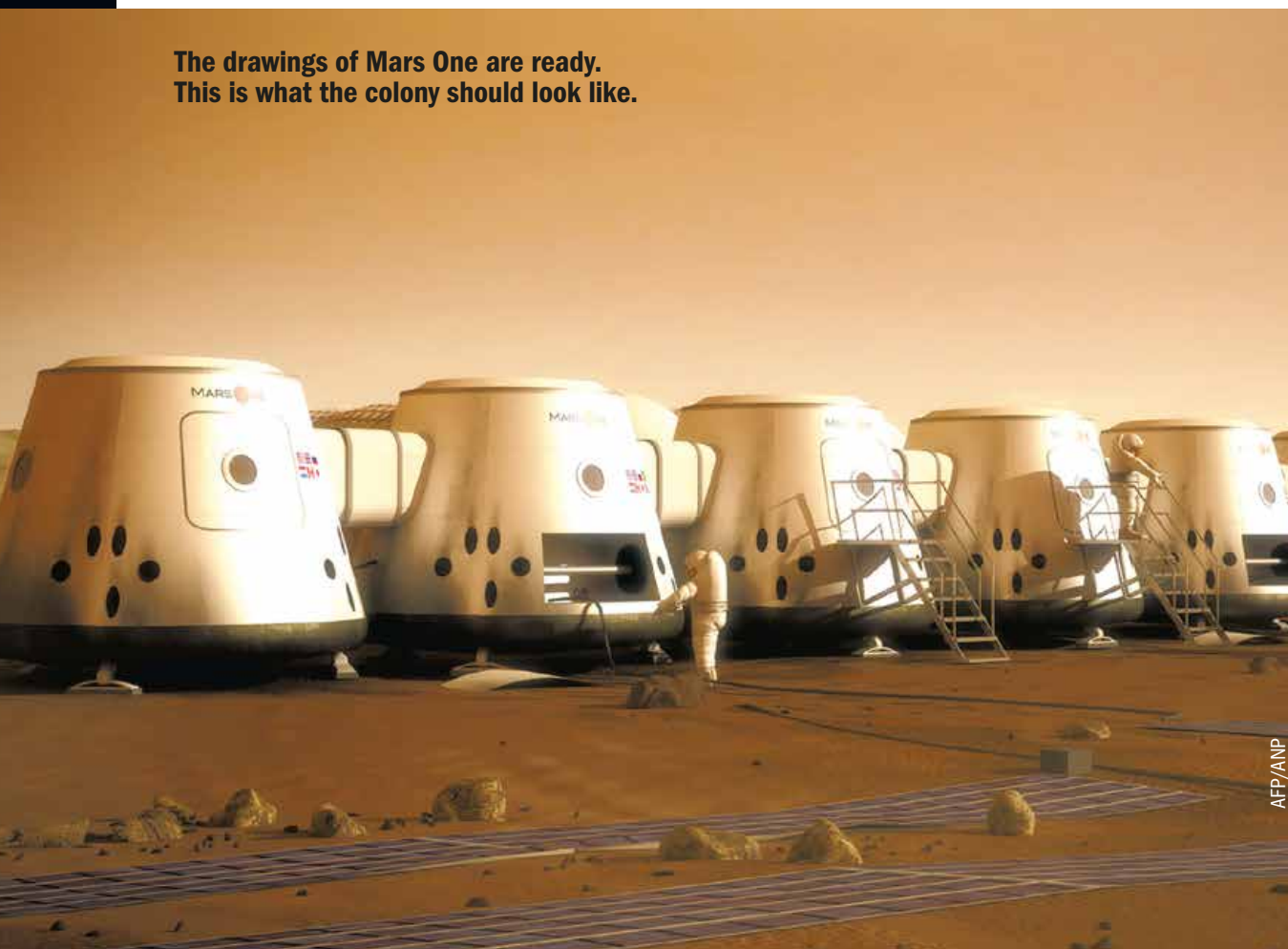
## ● Techniques are untested

No big new techniques have to be invented for Mars One, writes the organisation on their website. But a study in 2014 by the Massachusetts Institute of Technology (MIT) about the viability of this project proved the opposite. Mars colonists would have to grow their own crops to live off them. This is the plan of Mars One. According to the MIT study a lot of oxygen will be released then and this is a fire hazard. Techniques to prevent that have



Lots of practice is going on for the Mars mission. These 4 volunteers have been in a closed-off space in Moscow for nearly 18 months, just to see what long isolation does to people.

The drawings of Mars One are ready. This is what the colony should look like.



not been tested under space conditions. Also the devices that transform the ice on Mars into drinking water have not been tested. The amount of spare parts that will have to be taken from Earth by Mars One is very much underestimated.

And then there is still the matter of money. The cost of a one-way mission to Mars could amount to some \$6 billion. Critics think the estimation is too low. An important part of the mission would be paid by television rights. The whole expedition would be broadcast like a sort of *Big Brother*. But do people want to watch that? Earlier talks with the television stations came to a halt this year. This is a pity, but it is expected that the ambitions of Mars One will soon have to be adjusted. Beginning with its starting date.

## ● Couple to Mars

So can we go to Mars on a smaller scale? Yes, that is possible. The Inspiration Mars Foundation, led by American billionaire Dennis Tito (who stayed in the ISS as a paying tourist for a week in 2001), wants to build a spaceship in which a couple can make a flight to/orbit Mars. In 501 days, to be precise. And no one-way tickets: the couple will just return to Earth after their trip. Sounds





## Mars calendar

**P**lenty of vague plans, but which Mars expeditions are on the charts?

### Insight

**WHEN?** 2016

**BY WHOM?** United States

**WHAT WILL HAPPEN?** The plan is to plant a robot lander on Mars that will conduct geological surveys in the soil. This should give more clarity about the history of the planet.

### Exomars

**WHEN?** 2016 and 2018

**BY WHOM?** Russia and Europe

**WHAT WILL HAPPEN?** They first want to place a satellite in orbit around Mars. Then robot landers will be lowered to the surface. A rover will be brought to Mars 2 years later that will search for signs of (past) life. It is not quite certain if the rover will go to Mars.

### Mars 2020

**WHEN?** 2020

**BY WHOM?** United States

**WHAT WILL HAPPEN?** A rover will look for traces of (early/past) life and do geological research.

reasonable, until you hear the planned departure date: January 2018. Same goes here that the whole spaceship still has to be built.

And the finances? Dennis Tito partly pays from his own deep pockets. Then money also needs to be collected from companies and the rich and famous of this Earth. But NASA also has to pay, thinks Tito. NASA has already said they are not interested in this. You don't have to be a rocket scientist to know that all of this is never going to work by 2018. Pity. But this is how it regularly goes with plans for manned space flights. They are thought of quickly, but just as quickly discarded. Too expensive, too difficult, too risky. It is not for nothing that astronauts have only been orbiting around Earth since the last moon walk in 1972. Tourism in an orbit around Earth will certainly come, but it will be mainly for millionaires for many years. Cowboys who say they will quickly offer affordable flights to the cosmos are cheating everyone. Just remember that when tickets are offered somewhere. This is reality: sometimes a dream trip will just remain a dream trip. ■

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## Doomed for failure

**D**ozens of unmanned spacecrafts have been launched for Mars since the start of the '60s. But the percentage of failures is incredibly high: more than half of the missions did not end well. Talk of the 'curse of Mars' is not for nothing.

An overview of the failures since the '80s:

**1988:** Contact with Russian probes Phobos 1 and Phobos 2 is lost because of a software mistake.

**1993:** The American Mars Observer leaks fuel, loses balance and becomes

unreachable.

**1996:** The launch of the Russian Mars 96 fails.

**1998:** The Japanese Nozomi probe fails on the way to Mars.

**1999:** The American Mars Climate Orbiter lands in too low an orbit around Mars and is lost.

**1999:** Contact with American Mars Polar Lander is lost.

**2003:** The European probe Beagle 2 disappears for unknown reasons when it has to land on Mars. It is photographed at the beginning of 2015 by a

satellite that orbits Mars. **2011:** Russian Phobos-Grunt, which should have brought soil samples to Earth from the Mars moon Phobos, fails to leave the orbit of Earth and burns in the atmosphere.



The Mars Climate Orbiter that was lost in 1999.



### EXTRA INFO

[www.mars-one.com](http://www.mars-one.com): the organisation of Mars One.

[www.inspirationmars.org](http://www.inspirationmars.org): everything about the Inspiration Mars Mission.



You can plan as much as you like,  
but chance will have its way

# Lady Luck

*Do we get rich or go bankrupt? Do we arrive home safely or have an accident? We'd like to think we have a measure of control but we forget that someone else is pulling the strings. Lady Luck.*

■ TEXT: TONIE MUDDE





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# Casinos like to give us the impression that we

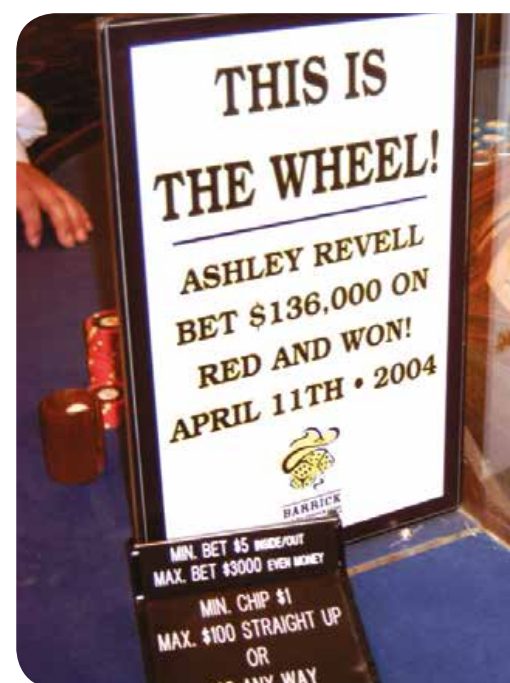
**H**is friends and family who heard of his idea think it's insane. Ashley Revell doesn't. In 2004 this 32-year-old Brit sells everything he owns. His car, TV, watches, mountain bike, Playstation, everything. He empties his bank account and buys a return ticket from London to Las Vegas. There he rents a smoking room and steps inside the Plaza Hotel & Casino. He takes his place amid a small crowd gathered around the roulette table. The Sky News Channel's camera team is also there. They have been following Ashley since hearing of his plan. It's quite simple: He is going to wager all his money, about R1.08 million, at the roulette table. The intention is not to spread it out over the course of the evening but to bet it all in 1 go. Revell stands eye-to-eye with the 2 croupiers across the table. They ask if he is sure about this. "Yes," he says as he nervously shifts his weight from one leg to the other. "I'm ready." His father looks on from a few feet away, smoking his pipe. He finds it ridiculous, but he is here. Because Ashley is still his son, in good times and bad. Ashley shakes his hand and turns back to the roulette table. The wheel has started turning. Ashley looks at the little ball on the table and asks: "May I kiss it?"

## ● The illusion of control

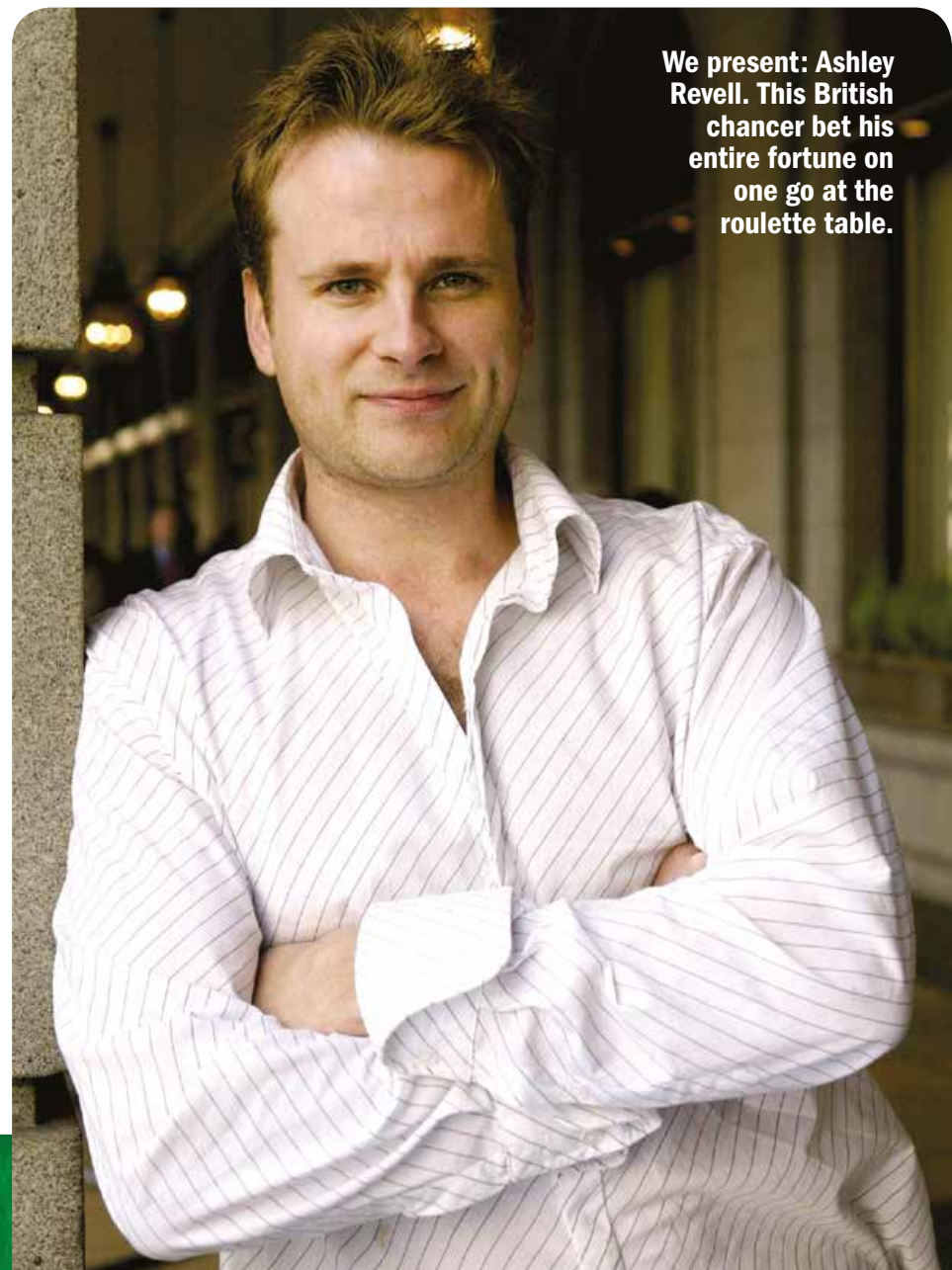
A kiss on the dice, a quick prayer, or rubbing a lucky charm. Most people in a moment like this would do something to sway Lady Luck their way. People simply cannot accept the idea that they have no control over a situation like this. We like to convince ourselves that we have a measure of control even when we are powerless bystanders.

Ellen Langer, an American psychologist, demonstrated this with a series of

experiments in the '70s. Like, for instance, asking people to play a game of heads-or-tails. One in every 4 believed they could predict the outcome better if they weren't distracted. As if a coin that's flying through the air really notices whether you're concentrating on it or not ... In another of Langer's experiments she had people participate in a lottery. Some could choose their numbers and others were given numbers. Then she gave them the option to swap their set of numbers for another set which could possibly win them even more money. What happens? Those who had chosen their own numbers wouldn't budge. The participants truly believed that they had a better chance at winning if they chose their numbers themselves. Casinos, too, have a clever way of playing on this illusion of control. Slot machines are



equipped with various buttons and handles, all giving the player the feeling that they have some kind of influence over the outcome. The same goes for the roulette table. Theoretically it



We present: Ashley Revell. This British chancer bet his entire fortune on one go at the roulette table.



# can tempt fate



A lucky winner is any casino's best advertisement.

makes little difference if the croupier decides on which number you bet your money. But YOU want to choose. Red or black? Even or uneven? And therein lies the power of any game of chance: it gives you a false sense of controlling your destiny.

## ● Dangerous illusions

Even people who have never seen the inside of a casino practice this illusion of control. Just ask someone "When are you less likely to have an accident: when you're in the passenger seat or the driver's seat?" Chances are the answer will be when they themselves are at the wheel. We make ourselves believe that when we are in the driver's seat, we're better protected against car pile-ups, drunk drivers, burst tyres and whatever else may come our way. The illusion of control can in itself be a very dangerous thing as explained in the book *Dance with Chance* ([www.dancewithchance.com](http://www.dancewithchance.com)). In it, 3 scientists describe the dangerous mindset of underestimating the role of uncertainty and coincidence. One example was that in the 3 years after 9/11, people thought that it would be safer to travel by car than by plane. The result? A significant increase in car accidents.



Want to throw a 5 or 6?  
You're likely to roll the dice  
harder than when you want  
to throw a 1 or 2.

Another way of succumbing to the illusion of control is undergoing preventative medical screenings. We hope to get an assurance of our health. The idea is that these screenings can save your life through early detection of medical conditions. This does happen but, as the authors of *Dance with Chance* point out, the tests can sometimes do more harm than good. There's always the chance of a false-positive result. You're told that

something is amiss when it's not the case. The result is that you go through the medical mill so to speak with everything that goes with it – treatment, costs, emotional upheaval. The best example of this is probably amniocentesis. This test determines whether an unborn child has Down

## Extreme coincidence?

■ In 2 consecutive draws of the 2009 Israeli lotto the exact same numbers were drawn: 13, 14, 26, 23, 33, 36.

■ The winners of the 2 independent pageants, Miss Germany 2010 and Mr Germany 2011, turned out to be a married couple.

■ In 2009 the volunteer fire brigade of Westbroek in the Netherlands decided to hold a fire drill at a nearby farm. Only to find the farm in flames on their arrival.

■ For someone to get stuck in a potato reaping machine is unlikely enough. But on 18 October 2010 it happened to 2 men in Britain. In completely different locations. Luckily both men were freed with their limbs intact.

## It could only happen to me ...

Imagine this: Just as you arrive at the bank an armed robber storms in. He starts shooting and a bullet hits you in the arm. Are you a lucky fish or an unlucky sod? British psychologist Richard Wiseman presents this scenario to a few subjects in an experiment. He also asks them how content they are with their lives. The results show how different people view coincidence. Those who are unhappy with their lives view getting shot as a great misfortune. Because, really, what are the chances that this could happen to them? People who are more content with their lives see it as pure luck that they only get shot in the arm. One subject even responds: "And you can sell your story to the newspaper!" Wiseman's conclusion: When a person sees themselves as unlucky it says more about their character than it does about what happened to them.





## The stock exchange is the biggest game of

### A nerd cracks the casino

It's the stuff Hollywood movies are made of. But this is a true story. In the '70s scientist Doyne Farmer visits a casino. He becomes fascinated with the roulette table and specifically the idea of predicting the outcome. Farmer goes to work. He smuggles a tape recorder into the casino. Every time the rolling ball completes a round, he taps the microphone. At home he compares the results and finds a link. For the next step he engages a group of friends he called The Eudaemons. They investigate the roulette table thoroughly. How fast the ball rolls. Which slot it touches first. Where it goes next. The Eudaemons, with the help of computers, are able to determine where the ball will stop. In the process, they make \$1.44 for every \$1 they put in. Still the project isn't a resounding success. The computer only predicts a certain area of the wheel, not the precise place the ball will land. So they have to hedge their bets by betting on every number on that area. And there's the danger of the casino catching on to what they're doing: they can only place their bets at the very last moment. They need the lead time for the tiny little computer to calculate where the ball will fall. And then one of them gets burnt when the insulation fails on the computer in her shirt. So they part ways. Farmer still earns his money with predictions, this time on the stock exchange. But then, he is a physicist and professor in chaos theory and complexity at the Sante Fe Institute ... an independent, nonprofit theoretical research institute dedicated to the study of complex systems.

► syndrome. But it can also, in a small percentage of cases, lead to the baby being aborted. All of this just to be sure that the baby has no defects. When the chances are that a healthy baby will be born if nature is left to run its course ...

#### ● Know your numbers

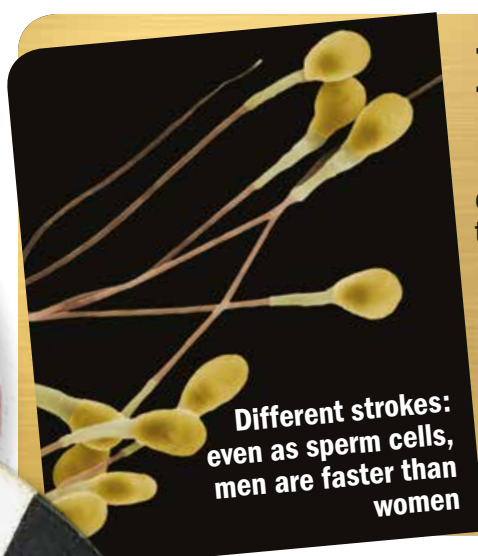
It's another mean trick you'll see in casinos. A clever scoreboard, right above the roulette table, displaying a list of the last numbers on which the ball landed. It gives players an illusion of control. People start reading all kinds of patterns into the numbers. So, for example, most players would think that if the dice fell on red numbers the last 5 times, it will surely fall on a black number now. But the chances are in fact still only 50-50. Even worse – the ball can fall on the green zero and then all bets go to the house. Outside the casino we get tempted in similar fashions. Think about those radio spots about stock exchange funds that performed well in the past few years. So you tend to think that the coming years should be the same. Let's buy that stock! At the end of these radio commercials there is always a disclaimer that "previous results are not a guarantee of future performance." History has proven time and again that this is indeed the case. It takes one economic crisis that nobody could foresee. Or a war. Or a financial scandal. Or a new technological invention.



All of these can have a major effect on the stock market. The American economist Eugene Fama has a very critical assessment of stock advisors. He puts them right up there with astrologists who believe they can see the future in the stars.

#### ● Big numbers rule

So how come market analysts can make accurate forecasts? Surely that can't be just coincidence? But even this unusual situation has an explanation. The very same explanation that applies to the roulette table where the dice



### Boy or girl?

The chances of having a boy or a girl are roughly 50-50. But there are fertility clinics that try to give chance a hand. Sperm cells with a Y chromosome (which make boys) are stronger swimmers than sperm cells with an X chromosome (which make girls). The labs organise the equivalent of a swimming gala, where sperm cells have to swim through a sticky substance. After some time, more 'Y sperm cells' than 'X sperm cells' will have reached the finish line. In this way a woman's egg cell can be fertilised by a relatively higher (or lower) percentage of 'male swimmers'. The Fertility Center of California claims that this method delivers the desired result 3 times out of 4. But their findings have been called into question by other medical experts.



# chance in the world

## Creative by chance

**L**eonardo da Vinci (1452-1519) regularly stares at his studio walls. For hours. The bizarre shapes of the water marks on his walls elicit all sorts of strange associations for the Italian. And that's kinda useful for his new paintings. Other creative careers also rely to some extent on the whimsical nature of chance, cleverly transformed. For instance, by choosing a random picture out of a stack during a company brainstorming session. The unexpected stimuli ensure that set thinking patterns are broken. This increases the chance of a new idea coming to light. Using chance as a strategy can also improve your social life. If you chat to only your own friends at a party, you're not really going to hear anything new. So instruct yourself to speak to every person who is wearing red. It's guaranteed to be an evening of interesting meetings ...

**Enlarge your social network using chance. Make a deal with yourself to, for instance, approach all men in striped shirts, or all women with blonde pony tails**

has fallen on black for the 10th time. There are so many thousands of roulette tables in the world. Which means the chances that one of these tables will have a succession of black numbers is actually very high. In just the same way you will find a handful of market analysts who will make accurate forecasts for a few years in a row. The law of big numbers is involved in all those strange-but-true stories. A meteorite crashes into a house minutes before a family arrives home. Typically, we think it can't possibly be a coincidence. We might even blame (or thank) divine intervention. Truth be told there are a gazillion people arriving home each day. And space debris regularly rains down on Earth. Now combine the 2 and it's likely to happen

to someone ... somewhere ... sometime soon.

### ● Useful coincidence

Do we have any say at all? Or should we just stop planning ahead because chance will decide everything in any case? Relax. It's not that bad. Merely by considering all the variables, we do make better decisions. For example, ask the doctor on duty what the chances are of having a false positive test result. Or, when presenting a budget, don't just present one set of figures but also make provision for a best and worst case scenario. The English chancer Ashley Revell thought long and hard about the consequences of wagering his entire existence on one bet at the roulette table. The 136,000 US dollars is a lot of money. But on the other

hand, he is only 32. And he's good with computers. He has many economically productive years ahead of him. He can make up for his losses. It is an acceptable risk. Maybe that's why he calmly watches as the croupier throws the ball. He puts all his money on red. He bites his lip. The ball goes from one number to the next. And then settles in the deciding slot. 7, red, victory! Revell's mouth falls open and he lets out a primal scream. He jumps around the casino into the arms of strangers. Spectators are concerned that this win would make Revell overconfident. That he might try his luck one more time. And then once more. But Revell is clever enough to know that it would render him penniless. He leaves the casino and flies back to London with about 272,000 US dollars. And how does he spend his money? He invests it in a very lucrative business – his very own online casino! ■

[braintainment@panorama.co.za](mailto:braintainment@panorama.co.za)



### EXTRA INFO

<http://tinyurl.com/AshleyRevell>

**Video of Ashley Revell's amazing bet**

<http://probability.infarom.ro/> **Online guide to probability for non-mathematicians**



Did you know that a good fight lowers stress and frustration?

# Fighting fit





*Yelling at each other, making accusations or not speaking for days? No problem, because fighting can actually be very healthy for you and your partner. However, you have to be good at it.*

■ TEXT: ELLY POSTHUMUS

**H**e had had enough. So he climbed out the window of his car and onto the roof. It didn't bother the American that the car was speeding at 100km/h on the highway. He and his girlfriend had had a fight during the trip. But because he couldn't stand the fight any longer, he decided to split. His angry girlfriend continued to drive. These two never got a chance to make up. The man fell off the roof and did not survive his stunt. Maybe it's a bit much to climb out of a car window onto the roof to avoid a conflict! But a good fight now and then could be very healthy.

● **Express yourself and lower stress**

We all have a fight now and then. Ester Kluwer, an international Social Psychologist, says: "people who claim to never fight are suspicious. Because, whenever there are two people together, there's bound to be conflict sooner or later. Whether you're best friends, family, colleagues or lovers, it is simply impossible to have the same thoughts about everything, to have the same needs and expectations. Sooner or later, you will have a fight." And that is not really bad. Whoever claims they never fight might be blocking anger and frustration. And

that, according to Kluwer, is not really a good strategy. The problem will resurface and will only get worse. Your relationship could soon end if you don't discuss important matters. In any case, it's not a healthy idea to let problems build up.

People who avoid conflicts will walk around with associated stress for a lot longer.

Researchers from the University of Michigan looked at fight behaviour and the mental and physical welfare of about 200 people. The subjects kept a record of having fights and avoiding fights, for 8 days.

Conclusion? Those who avoided fights had more physical complaints (like nausea and pain) the next day, than those who fought it out. Aside from that, the saliva of the 'avoiders' contained more of the stress hormone cortisol – and they had more trouble calming down. According to Dutch Psychologist Ernest Harburg, fighting can even prolong your life.

He followed about 200 couples for 17 years. He discovered that if both partners suppressed their anger, twice as many people died than when one of the partners expressed their anger.

● **Excess harms**

It is now clear; rather don't

## No mercy

**F**orgiving relieves. However, be careful of forgiving too quickly. Psychologists from the University of Tennessee (USA) discovered that more forgiving people have to endure more mischief from their partners than less forgiving people. 135 newlyweds filled in a questionnaire every night. Did their partner misbehave that day by nagging, shouting, using sarcasm or by being in a bad mood? Did they forgive him or her? The partners who were forgiven for their behaviour on the same day, misbehaved twice as much the next day, as the partners who were not forgiven for their behaviour.

hide your displeasure.

However, this doesn't mean you can just let rip. It might help a little for now to scream or throw things. But fighting too much and too often increases your chances of mental and physical discomfort like heart disease, chronic pain, eating disorders, depression and excessive alcohol abuse. We can even find the results of excessive arguments in our blood. In research done at Ohio State University, partners were requested to discuss a conflict for 30 minutes. Straight afterwards, their blood and immune systems were tested. Conclusion? Blood pressure of violent partners increased and stayed up for longer than from partners who fought in a milder way. Also, the immune systems of fierce troublemakers were less effective after a fight than those of milder troublemakers. For a woman, there is even more risk. Women who are in a relationship with lots of arguments are more prone to illness than men in the same relationship.

## Travel tension

**R**elax and enjoy. That's the reason why most people go on holiday. But that's not always how it goes. Fights often already start on the way to our destinations. This results in:

- Calls for a pit stop so everybody can cool down.
- Families trying to change the subject along the way.
- Giving each other the silent treatment.
- Parking on the side of the road and refusing to carry on.





# Too much anger is not good and too little is also not effective during a fight

## You don't understand me?

**T**he one (read: man) is silent during a fight, the other (read: woman) wants to discuss it all. Because of this, women blame men, saying that they don't understand them during a fight. But is that right? Psychologist Marta Mather, of the University of South California, showed subjects photos of angry people during more and less stressful situations. At the same time, she studied their

brains. The area in the brain that processes the visual information and the understanding of the facial expressions and emotions was activated while looking at angry pictures, both by men and women. The activity in the male brain was less under stressful conditions. The female brains showed increased activity under stress. So we can conclude that men don't understand angry women.

### ► ● Anger makes you sharp

So, too much fighting is not healthy. Kluwer: "If you realise during a fight that you are too angry, best take a break. Just go outside and resume the fight when you come back feeling calmer. Leave some of your anger outside, but not all." Researchers of the University of California in Santa Barbara found that a little anger can help you think more critically. They asked a group of students to think back to an event that angered them. A second group of students had to think back to a neutral event. The researchers then left the students to judge the arguments. Those students who were a little angry could

separate good arguments from bad arguments better than the students with neutral events. So what can we conclude from this? A mild argument will enhance our analytical ability and might come in handy during a conflict.

### ● Don't blame

It is easier to explain better once you have calmed down. So how do we make sure a fight does not escalate out of hand? Make sure that you know what the argument is about and stick to it. Kluwer: "Quite often, when people fight, they involve all sorts of other issues (that are still lingering) from the past into that argument. That's no good. Just focus your



There is always a suitable weapon at a birthday party.

criticism on the behaviour of the other person and not directly at the person. For example, if your girlfriend decides that she has to quickly fix her make-up or change into another outfit, while you have been ready for the last half

hour; don't go and accuse her that she always leaves everything to the last minute and never hurries up. She will feel threatened, react angrily and defend herself. You will end up in an 'attack-defend' fight. The question will remain:

## Ready to fight

**W**e all fight. How often do we fight and how do we handle our feuds?

- Happy couples have 1 to 3 arguments per week. Of these, 1 to 2 per month are unpleasant.
- Couples who are less happy about their relationship have, on average, 5.4 conflicts in 5 days.
- Most fights are about household tasks, jealousy, possessiveness, sex, money and possessions, friends, family and children.
- 1 out of 3 people claim that it's the other (partner) who starts the fight.







**read more @**   
[braintainment.co.za/issue3](http://braintainment.co.za/issue3)

## Angry men earn more?

**G**etting angry is good for your business image. At least, when you're a man. For a woman, it's sometimes better to hide your anger at work. Psychologists of the Yale University have discovered this. They had people watch video footage where actors acted out a job interview. The actors would express anger, sadness or show no emotion. The people would judge if the applicants were suitable for the job, whether they should be hired, how much responsibility they should get and how much they should earn. When men would express their anger, they received more responsibility and were awarded with a higher income, than when they showed sadness or no emotion. On top of that, people found that angry men were more suitable for the job. Angry women had a negative effect. They were less suitable for the job. Showing sadness only had an effect on women. It resulted in a lower salary. If no emotions were shown, both men and women were treated the same.

"will she be ready in time, next time?" There is an art to solving problems without blaming the other. Tell her that you hurried to get ready and now you have to wait. And that you don't like that. Explain why it is important for you to be on time and ask that she takes this into consideration. If you can manage not to blame, your problem becomes discussable. And the chances are good that you will find a solution.

### ● Sorry helps

No matter how moderate the fight, it can happen that you hurt the other person. You could try make-up sex with your partner. The idea behind this: sex will restore the bond that was kicked out during the fight. It feels good too. Also, during a fight your adrenaline and dopamine levels will have risen and these hormones give

you an excited feeling. After a fight, you will be more aggressive, passionate and determined, all of which might come in handy during a good bit of sex.

Don't feel like sex? No problem. Saying you're sorry also helps. However, only saying sorry doesn't help. "Sorry I shouted at you this morning" does. Make sure you don't give an excuse for your behaviour. "Sorry I shouted at you this morning, because I slept badly" whips your responsibility away. I did this, I hurt you and I am sorry for that. That's the best you can say, explains Kluwer. This also makes it easier to forgive each other. If you don't, you might stay angry and resentful for longer. ■

[braintainment@panorama.co.za](mailto:braintainment@panorama.co.za)



### EXTRA INFO

<http://www.psychologies.co.uk/tests/how-do-you-deal-with-conflict-in-your-relationship/>

**Put your relationship to the test**

<http://www.relationshipheadquarters.com/> **Sound relationship advice**

**With or without flowers, it helps to say sorry after a fight. Make sure you take responsibility for your actions.**





# Stupid research!



*It took researchers blood, sweat and tears. But at last, we have groundbreaking results such as the fact that drinking games make you drunk. Here's a list of no-brainers that researchers have discovered.*

■ TEXT: TONIE MUDDÉ / ILLUSTRATIONS: BARBARA MOGET

## 1 WEEKENDS ARE FUN

### Discovery?

People are most happy on the weekend.

### By whom?

University of Rochester (2010)

### No-brainer?

Yes, just like the reason for this weekend effect. People

decide themselves what to do on weekends. We also like to spend time with friends and loved ones on Saturdays and Sundays. These are all factors that make people happy, according to bright researchers.

## 2 A BALL MAKES YOU PLAY

### Discovery?

The presence of certain toys – such as balls, bicycles and skipping ropes – make children move about.

### By whom?

University of North Carolina School of Public Health (2007)

### No-brainer?

Duh!

## 3 MOTIVATION WORKS

### Discovery?

Companies benefit from motivated workers.

### By whom?

BI Norwegian Business School (2010)

### No-brainer?

Yes, even when the researcher tried to present his findings with complicated sentences like: if companies want to get the most out of their workers, they will profit from the creation of conditions that will motivate their staff in the highest possible way.

## 4 LOSE WEIGHT WHEN YOU DIET AND DO SPORT

### Discovery?

Heavy-bodied ladies over the age of 50 lose weight by dieting or doing sport. But, and here is the really big news: they lose weight even quicker when both strategies are combined.

### By whom?

Fred Hutchinson Cancer Research Centre (2011). Apparently, they also research other diseases apart from cancer.

### No-brainer?

Yes. And the follow-up research is even less promising. Researchers now want to find out what women have to do to keep the weight off. *Braintainment* has a wild guess: a combination of eating healthy and sport will work best.



## 5 CHILDREN REACT TO SCARY STUFF

### Discovery?

Children with an anxiety disorder will stop sooner with their activities after watching scary movies. This is compared to children without anxiety disorders.

### By whom?

University of Amsterdam (2010)

### No-brainer?

It is if you knew what was featured in these movies. Included in the list of frightening objects were spiders, Pit Bulls and needles.

## 6 BOOZING WILL GET YOU DRUNK

### Discovery?

High concentrations of alcohol were found relatively often in students with the following criteria:

1. Students who were notorious boozers.
2. Students who participated in drinking games.

### By whom?

San Diego State University (2007)

### No-brainer?

Yes. Although we have to give credit to the hard work and effort researchers put in – they visited 66 student parties for their study!



The discovery of the  
century: weekends  
are fun!



### EXTRA INFO

Get more weird science articles at [braintainment.co.za/issue24](http://braintainment.co.za/issue24)



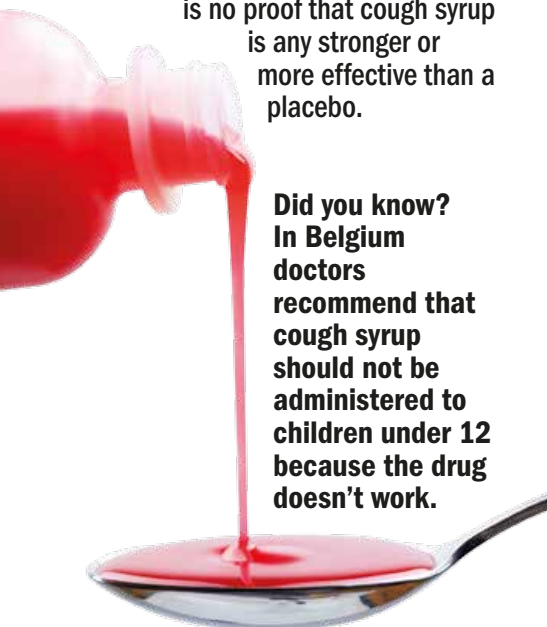


## How does cough syrup work?

Tyrone Jacob, Midrand

**C**ough syrup contains 2 substances: antitussives (suppressants) and expectorants. Antitussives block the cough reflex, mostly present with a dry cough. The expectorant will help you more with a phlegmy cough. This will make the cells in your lungs secrete more moisture. This moisture will dilute the phlegm, thereby making it easier to cough up and out. However, it is unlikely that cough syrup is really effective. In 2008, an article in the US journal, *Scientific American*, argued that there is no proof that cough syrup is any stronger or more effective than a placebo.

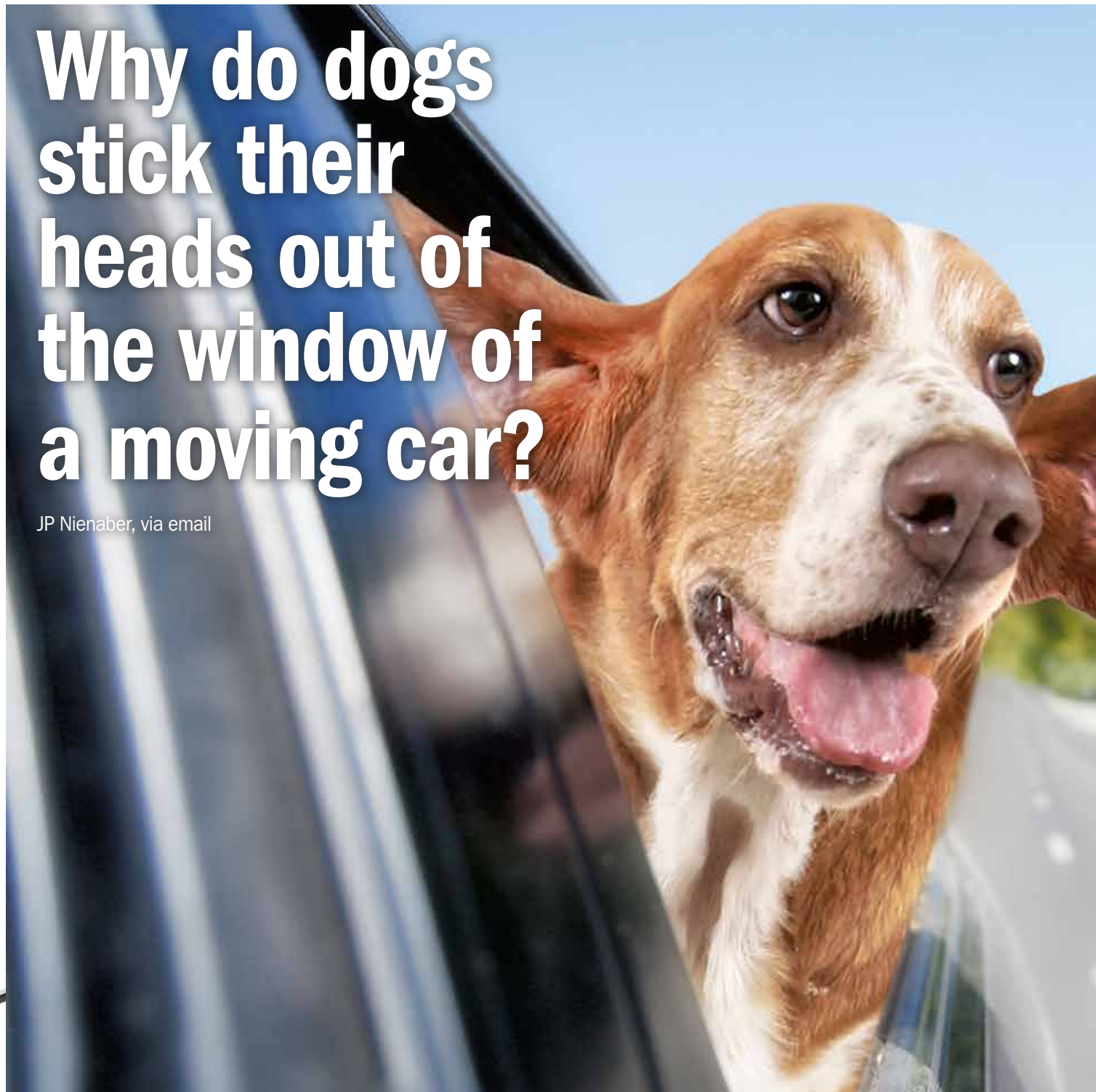
**Did you know?**  
In Belgium doctors recommend that cough syrup should not be administered to children under 12 because the drug doesn't work.



PLAINPICTURE/HOLLANDSE HOOGTE

## Why do dogs stick their heads out of the window of a moving car?

JP Nienaber, via email



## What would happen if you could keep your eyes open while you sneeze?

Sarah Burrows, Johannesburg

**I**t is a myth that your eyes will pop out if you keep them open while you sneeze. Popular television series *Mythbusters* once featured people who were able to keep their eyes open while sneezing. Other than looking a

little bizarre, there was no effect. That's because the closing of the eyes while sneezing is a reflex and has no meaningful function.

**We sneeze to clear our noses.**



IMAGE SOURCE/GETTY IMAGES

Q&A

## FLASH

- Did you know that 12-year-old British Donna Griffiths started sneezing on 13 January 1981?
- She only stopped on 16 December 1983.
- This 978-day long sneeze attack earned her a place in the 2004 *Guinness Book of World Records*.





**A** dog has more than a million scent receptor cells located in the nose and roof of its mouth. Its sense of smell can provide information about the world at large. When a dog sticks its head out of a car window, it gains a great deal of information through the many scents that fly by its nose during a car ride.

Another obvious reason is that the cool breeze created by the moving vehicle is refreshing. Just as we humans enjoy a little wind in our faces, so do our furry canine friends. Perhaps the most compelling reason for a dog to hang his head out of the window is the fact that a dog's sense of smell, which has proven far superior to that of humans, is a means of learning about its environment. After all, dogs are intelligent animals that use their eyes and noses to explore the world around them.

Although a dog can truly enjoy the experience, sticking its head out the window makes it susceptible to injury from insects, birds, flying stones and other debris. There is even the potential for injury from an object on another vehicle, a sign or branch.

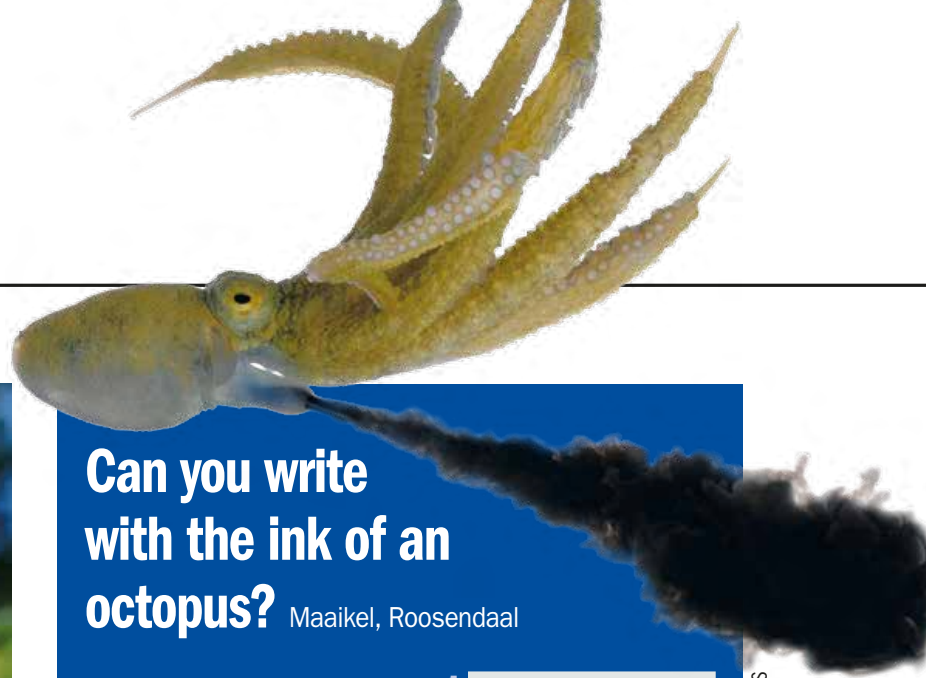
## Many women prefer taller men. So, why is it that women wear heels and men don't?

Ayanda Sibande, Durban

**W**omen usually wear high heels because it makes their legs look longer. Most men find this sexy. Polish researchers recently discovered that men found photos of female legs that were extended with Photoshop more attractive than the same

legs without extension. Researchers think that this is because long legs mean health, something that your partner judges and chooses unknowingly. And rightfully so. Research shows that people with shorter legs have a greater chance

of heart disease and diabetes. The preference for longer legs also goes for women. So why don't men wear heels? Probably because men are more inclined to go for looks than women are. This is also the reason why women wear more make-up.



## Can you write with the ink of an octopus?

Maaikel, Roosendaal

**Y**es, you can pen your thoughts with octopus ink. In fact, octopus ink was very popular in the 19th century and was often used for drawings. It was first dried and then mixed with a lacquer to make it water resistant. This brown-black ink was called 'sepia' after the Latin name for 'seacat'. That is the type of octopus that the ink was derived from. You can also write with pure octopus ink, although diluting it with a little water is recommended. Furthermore, octopus ink is used to dye food such as black pasta. That said, if you are planning to write a best-seller, it is best not

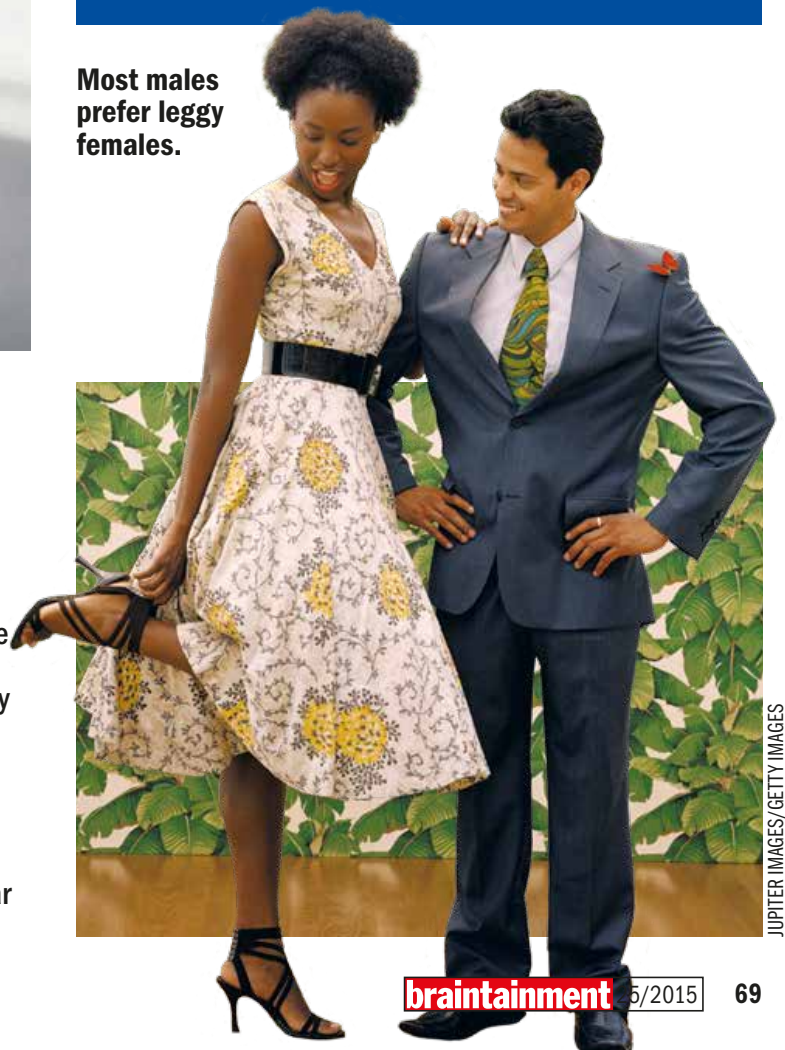
**Q&A**

### FLASH

- Nearly all octopuses have an ink bag, except the nautilus and a number of deep sea species.
- They only use the ink when they are in danger. They squirt it into the water and disappear behind the ink cloud.
- Octopuses can change colour. They do this to camouflage themselves or to communicate with their fellow species.

to do so using octopus ink. The acidity in the ink will destroy the paper in due course.

**Most males prefer leggy females.**







JPS/MMR/REUTERS

Alexis Cooper was born healthy 9 months after being in the womb of her comatose mother.

## Can a woman in a coma deliver a healthy baby?

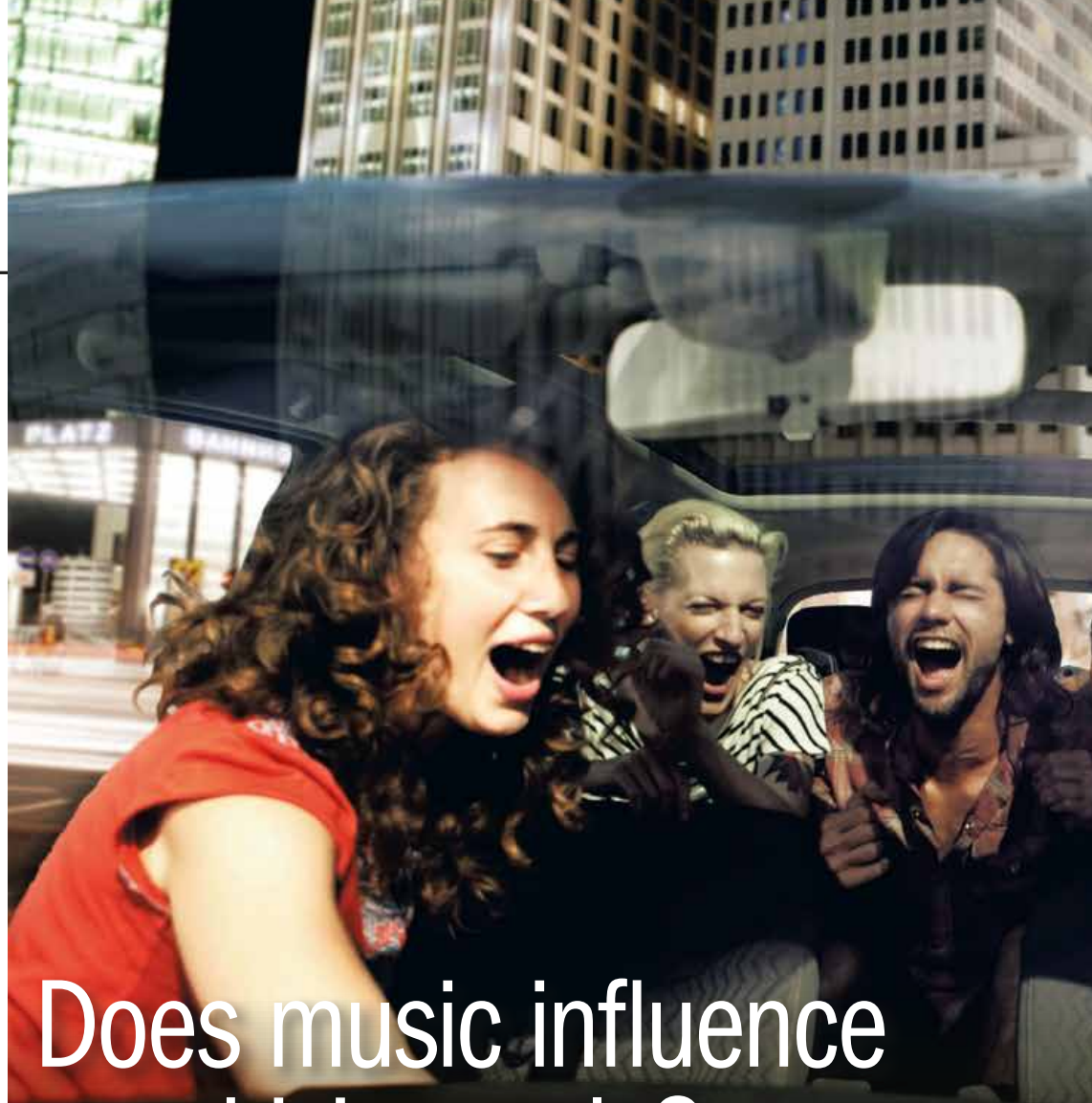
Alpha Kensington, via email

**I**t is possible, although complications during delivery and the chance of the baby dying are a lot higher than with a healthy woman. A comatose woman doesn't even need a caesarean section. The body will do her work without the influence of the mind. It doesn't happen a lot because not many comatose women fall pregnant. Also, the cause of the coma usually also results in the loss of the baby.

## Q&A FLASH

- The word 'coma' is derived from the Greek word *koma* which means 'deep sleep'.
- A state of unconsciousness that lasts longer than 6 hours is classified as a coma. The depth of a coma is determined with the aid of pain stimuli.
- The longest coma ever was 37 years. Elaine Esposito fell into a coma in 1941 (she was only 6) and died in 1978, still comatose.

JAN BOEVE/HH



## Does music influence our driving style?

Andrea van Rensburg, Knysna

**D**utch researchers of the Philips Research Centre researched the influence of music on driving style. They deduced that if the driver experiences the music as positive, it also influences his driving style positively and makes him a more

cautious driver. On the other hand, negatively charged music had no effect whatsoever. However, because everybody experiences music differently, there is nothing conclusive to say about the effect of, for example, metal or classical tunes.

You need more than 7 jumping people to cause an earthquake.







JOSEF LINDAU/CORBIS

Birds of a feather – and ‘dialect’ – prefer to flock together.



GEOFF DU FEU/GETTY

## Are there language barriers between animals?

Lawrence Davids

**T**his is difficult to deduce as animals don’t stick to the man-made country borders. Still, there is proof that there is some sort of dialect among various animals. Researchers found that whales from different sides of the ocean produce different sounds. It is not clear if they can understand each other. Furthermore, when it comes to birds there are

various groups that have developed their own tunes. Here, as well, it is not clear if they can understand

each other. It does seem however, that birds prefer a partner with the same ‘dialect’.

**Does music influence your driving style? Take our online poll at [braintainment.co.za](http://braintainment.co.za).**



## What happens if the total world population jumps at the same time?

Christine Clark, Johannesburg

**N**othing much will happen if everybody, wherever they are, jumps at the same time. That’s because the force is divided over the whole globe. But if we all gather on the same spot, it could cause an earthquake. A mini-earthquake caused by humans is not uncommon. When the band Oasis performed in London in 1995, 20,000 jumping fans caused earthquake-like tremors that were felt more than a kilometre away. The most extreme was a live performance by celebrated ska music group, Madness, in London Finsbury Park in 1992. It is believed that 75,000 jumping fans caused a quake measuring 4.5 on the Richter scale. It was strong enough for authorities to evacuate nearby apartment buildings.

## Q&A **FLASH**

- The largest recorded earthquake in the world was a magnitude 9.5 on the Richter scale in Chile on 22 May 1960.
- The first ‘pendulum seismoscope’ to measure the shaking of the ground during an earthquake was developed in 1751, and it wasn’t until 1855 that faults were recognised as the source of earthquakes.
- Most earthquakes occur at depths of less than 80km from the Earth’s surface.

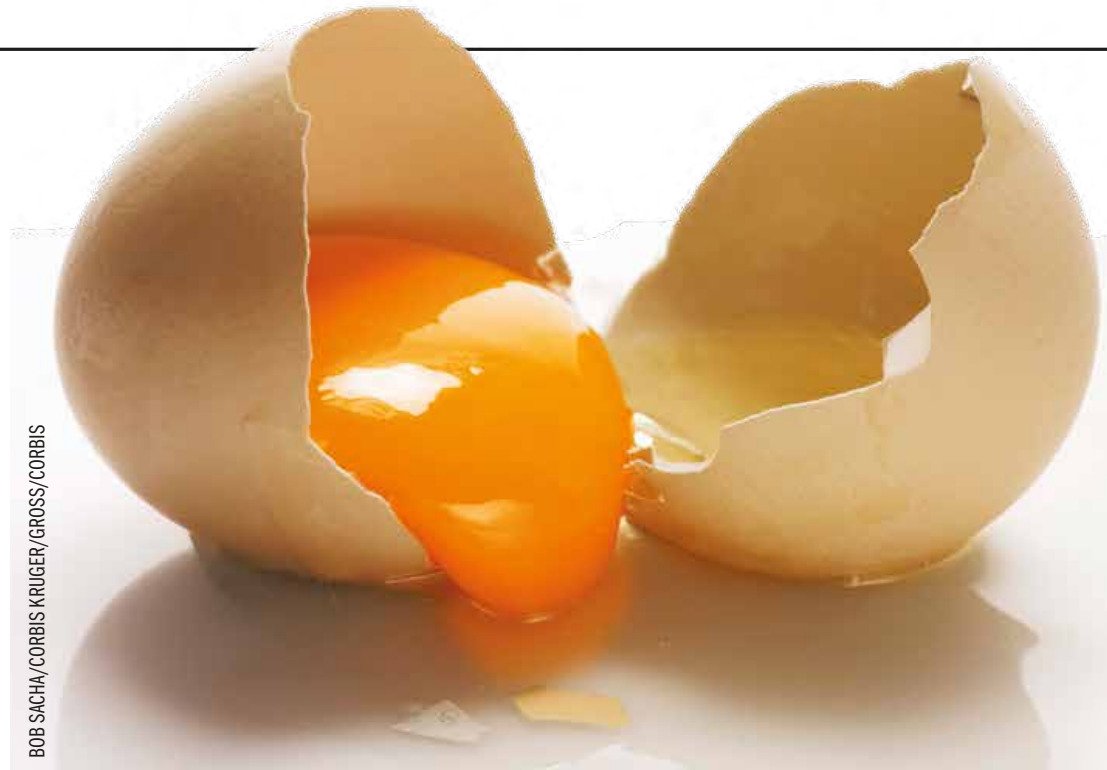


## What, after humankind, is the most successful animal species?

Tyrone Jacobs, Johannesburg

If we only speak about numbers, then there are various animal species more successful than humankind. There are many more ants than men, and although we can't really count them, the estimated number of ants is about 10,000 billion. In addition, there are possibly 27 times more termites on earth. However, if you are looking for an animal species that has really large numbers, look no further than the dust mite. They are found all over the world in mattresses and carpets. There are, according to

estimates, about  $10^{20}$  dust mites on the planet. All these groups of animals have different species. For example, there are about 12,000 different ant species; how many ants in each species aren't known. So we actually can't compare them with humankind, where there is only one species. The common mouse is often mentioned as one of the most frequent species on earth. Every city has loads of the little guys. There are probably just as many mice as men, maybe even more.



BOB SACHA/CORBIS KRUGER/GROSS/CORBIS

## Can you break an egg yolk by shaking an egg?

Sarah Jenkins, Harare

A small test with 3 eggs shows us that it is possible to mix the egg white and the yolk by shaking the egg really hard. Egg white and yolk are separated from each other by a yolk membrane. A chicken embryo grows in the yellow part,

which serves as food for the growth of the developing chick. The egg white is like a protective layer and prevents mixing of both the yellow and white parts. The membrane can withstand a bit of shaking, but not brute force.

BOB SACHA/CORBIS



The mites will be 0.3 millimetres wide.

IMAGE SOURCE/CORBIS



## Why is it that your arms have no strength when you wake up?

Lorena Jacobs, Durban

Besides your arms, there are a few more things that don't work so well when you have just woken up. Co-ordination, your reflexes and the carrying out of complicated mental tasks are also more difficult in the first few minutes after you have awoken. It can take up to 10 minutes

before everything works well again. This is different for every person. It also depends on the sleep phase that you have awoken from. When you wake up suddenly from a deep sleep, you will have more problems. The cause of this 'sleep inertia' or 'sleep drunkenness'

is unknown. One theory is that it has to do with the neurotransmitter adenosine. This substance gives you that sleepy feeling. The remnants of adenosine still have to be broken down when you wake up suddenly and this usually takes a few minutes.



## How do you get soft filling into a chocolate?

Kayden Botma, Randburg

**F**irst, the chocolatier makes a shell. Next, the chocolate is poured into a mould for the soft choccies. Then they are turned over so the excess chocolate runs out. They are then packed with a filling such as cream, caramel or praline. The chocolate lid (actually the bottom) is put on after about 15 minutes of drying. The shell is then dipped in liquid chocolate and gets hard when it dries.



HERMAN WOUTERS/HH



SHUTTERSTOCK

## Why do birds move their heads up and down so abruptly?

Michael Cronje, Johannesburg

**H**umans don't only move their heads but also their eyes to follow a moving object. Birds are not so good at that. Their eyes are relatively big and fit tightly into the skull. This limits their eye movement, which they compensate by moving their head. Besides, most birds have eyes on the sides of their heads. This gives them a larger field, but the area that they can see with their eyes is limited. As a result, they struggle to see depth. So, if it wants to gauge this properly, a bird has to move its head.

## What is the effect on your eyes when you look at a screen for a long time?

Ronel Harper, Vryburg

**I**t is a misconception that looking at a screen for a long time is harmful to your eyes. The only thing that could happen is that the muscles around your eyes get

tired of focussing at the same distance over a period of time. Glancing at something else solves that problem. Also, watching television for a long duration presents no harm for your eyes. There is no permanent damage; however, some parents like to think differently.

### Q&A **FLASH**

- Watching television might not cause any damage to your eyes, but it is unhealthy.
- Children who watch too much television are on average fatter and perform poorly at school.
- This is not caused by the television-watching in itself, but because the children spend less time exercising and learning.



SHUTTERSTOCK





Even a dead body contains useful information.

## How can the police know, simply by investigating a corpse, in which part of the world someone grew up?

Fred Bishop, Margate

**T**hey can sometimes do it through a so-called 'isotope analysis'. Certain chemical elements are found across the world in different variants (isotopes). For instance, there are 3 forms of oxygen which occur in different ratios. If you live in a

certain area, you'll drink, via your local water supply, the specific ratio that occurs in your area. And if you live there long enough, the ratio occurs throughout your whole body. By comparing the ratio of oxygen isotopes in the dead body to the isotope ratios in

different parts of the world, forensic scientists can deduce where the victim lived for extended periods. Besides oxygen, strontium, sulphur and lead are suitable for analysis based on isotopes. These substances also occur in different ratios.



## Can someone with a donor organ become a donor himself when he dies?

Pascal Schutte, Cape Town

**I**n theory, yes. But the chances that it would actually happen are small, says the Dutch Transplant Foundation's Janine van Trierum. "Before any donation, there are strict requirements: the donor must die in a hospital, preferably in the Intensive Care Unit. That's because the donated organs require a constant oxygen supply, otherwise they are no longer suitable for donation. And of course, the organ itself has to be in excellent condition." These requirements mean that very few organs are suitable for transplants. The chances that an organ recipient's donated organ would still meet these requirements after his own death are even smaller.

That's probably why, as far as is known, it's never happened that a donated organ was re-donated.

**Q&A FLASH**

- In South Africa, there are more than 3,500 people waiting for organ transplants, according to the SA Organ Donor Foundation.

- You can register to donate an organ at [www.odf.org.za](http://www.odf.org.za).

- You can choose which organs you're willing to donate.

## Where do mosquitoes go in winter?

Yvonne Muller, Mbombela

**M**osquitoes can't stand the cold. And most of them die during winter. Some survive by hiding in warm places, like small crevices in houses. There they spend their time snoozing winter away. Mosquitoes are cold-blooded. That means they need heat to function. That's why they only get active again in spring, and go on the hunt for fresh blood. Mosquitoes don't live more than a few months. So they can survive a maximum of one winter season. The survivors provide the next generation.

Where coils fail, winter takes over and kills mosquitoes.





# How heavy must an object be before you can feel its gravitation?

Tom Smit, Bloemfontein

**I**t depends on where you are. Here on Earth an object can be light enough that you don't feel its gravitation, officially known as its 'gravitational force'. In space it's different. It works like this: All objects, including humans, have mass. The higher its mass, the higher its gravitational force (or magnetic force). The force means everything pulls at everything else. Light objects pull a little, heavier objects pull more. The TV pulls at the plug and vice versa. You pull at your neighbour in the movies. And vice versa. But on Earth you don't notice it. The magnetic force of our planet is so immense it overpowers all other gravitational forces between objects with mass. But if you were floating through space with a friend, you'd automatically drift towards each other – even if you weigh only 80kg. It could take a while though. If you're 100 metres away from each other floating in the same direction at the same speed, it would take 125 days before you reach each other.



If you've been weightless, you become very aware of how much the Earth pulls at you.



# Why do we eat 3 meals a day?

Jules Hlowgwawr, Utrecht

**T**he short answer: because we get hungry again about 4 to 5 hours after our last meal. The time frame varies according to the climate and how much physical labour you have to do. In northern countries, people tend to eat much more than in southern countries. Because it's colder in the north, you work through the available energy in food much faster. In earlier times, labourers

sometimes ate 4 or 5 times a day. But hunger isn't the only thing that determines dinnertime. In the Middle Ages, for instance, it was considered a sign of weakness to eat more than twice a day. And since the industrial revolution, mealtimes have been determined by work hours. You eat before or after work. Plus, depending on the whims of your employer, somewhere in between as well.

# Who decides what to call a new hurricane?

Henry Fisher, Howick

**H**urricanes are named by the World Meteorological Organisation (WMO). The WMO has lists of 6 names per letter of the alphabet. The first hurricane of the season gets a name that starts with the letter A – Andrew, Alex or Ana, for instance. The next hurricane gets a name that starts with a B, and so on. A male name is followed by a female name, and the letters Q, U, X, Y and Z aren't

used. The WMO also recycles like good citizens: after 6 years, they start all over again and re-use names. But there are

exceptions. If a hurricane has been particularly destructive, or claimed victims, the name is not repeated. In 2005, the

names Katrina, Dennis, Rita, Stan and Wilma were removed from the list. In 2008, Gustav, Ike and Paloma disappeared.

After the damage Katrina did to New Orleans in 2005, no other hurricane will ever carry the same name.



# O&A FLASH

- Depending on its location and strength, a tropical cyclone is referred to by names such as hurricane, typhoon, tropical storm, cyclonic storm, tropical depression, or simply cyclone.
- The word *hurricane* comes from the word *Hunrakan*, the name of the Mayan storm god.





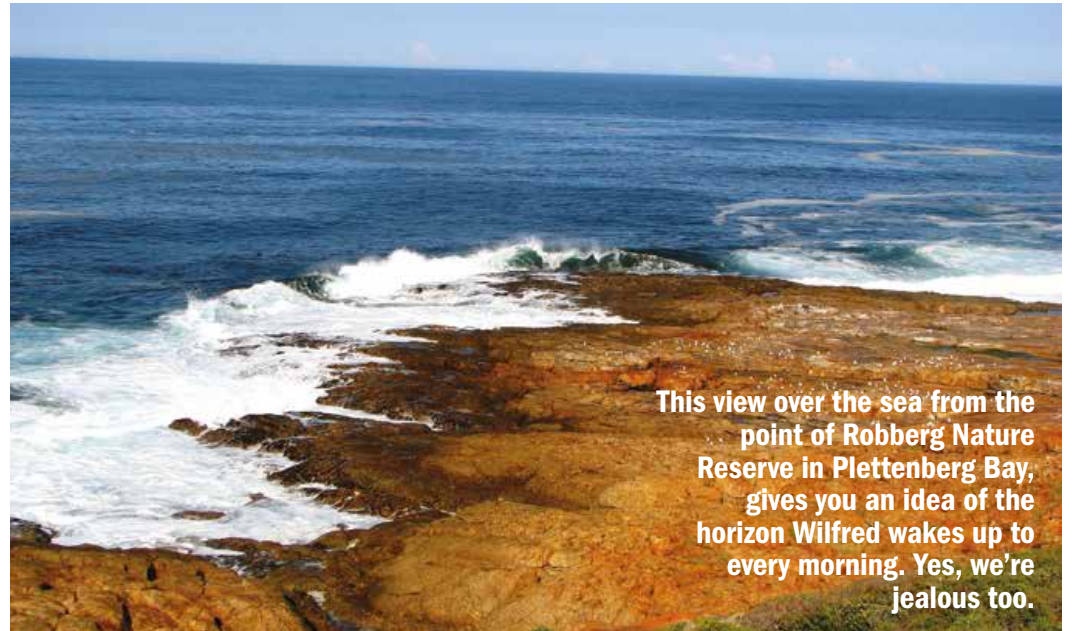
**How is it possible that I have no white spots or holes on my T-shirt at navel level, but my navel is filled with fluff almost daily?**

Johnny Robertson, Blackheath

**B**elieve it or not, but universities have done studies on it. Well, one at least. Karl Kruszelnicki, professor at the University of Sydney, questioned 4,799 people about the phenomenon. The navel seems to be a good gathering spot for all sorts of fluff. And that fluff comes from both your outer- and underclothes. Fluff from as far as your underpants can reach your navel. Basically, navel fluff doesn't just come from the fabrics around your navel. Kruszelnicki also discovered that around 66% of the respondents produced navel fluff. And the hairier the area around the navel, the more fluff you collect. That's why older men get more navel fluff. And people whose belly buttons pop out collect more navel fluff than those with hollow navels.

## Q&A **FLASH**

- Karl Kruszelnicki won the Ig Nobel Prize with his research.
- This counterpart to the Nobel Prize is awarded to research that first makes you giggle and then gets your mind going.
- Other winners have included research into frogs that float, necrophiliac ducks with homophiliac tendencies, and non-drip tea pots.
- The record holder navel fluff collector is the Australian Graham Barker. His navel collects around 3,03 milligrams of fluff every day.



This view over the sea from the point of Robberg Nature Reserve in Plettenberg Bay, gives you an idea of the horizon Wilfred wakes up to every morning. Yes, we're jealous too.

## How do I calculate how far I am from the horizon, if I know how far above sea level I am?

Wilfred Wilms, 83m above sea level, Plettenberg Bay

**H**istorically, knowing the distance to the visible horizon (particularly at sea) was extremely important. It represented the maximum range of communication and vision. Before the development of the radio and the telegraph, that is. These days, we do it mostly for fun. There are a number of rather complex formulas to work out the distance to within a few millimetres (Google is your friend here). But there's also one that will give you an approximate

distance (good enough for our maths brains). Basically, the distance to the horizon is roughly equal to the square of your height above sea level, multiplied by 3,856. Or

$$d \approx 3.856 \sqrt{h}$$

(d stands for the distance to the horizon in kilometers. H is the height above sea level in metres). So Wilfred, you're about 35 kilometres from the horizon.

**Is it true that the Monopoly game was used to smuggle maps and other escape equipment to Allied prisoners of war in 'care packages' during WWII?**

Tim Paine, Centurion

**Y**es and no. Waddington's, which had the licence for Monopoly in the UK, got involved when it realised its game would be allowed in the care packages delivered to POWs. A special group of workers carved depressions into the boards and filled them with maps, compasses and files, before covering the depressions with stickers depicting the

street names in the game. The maps were printed on silk because it doesn't rustle when unfolded. Hidden among the game's play money was some real money to aid escape. But some of the more fanciful claims (like the maps showing escape routes and safe houses) are not true. Too dangerous if the maps fell into the wrong hands.

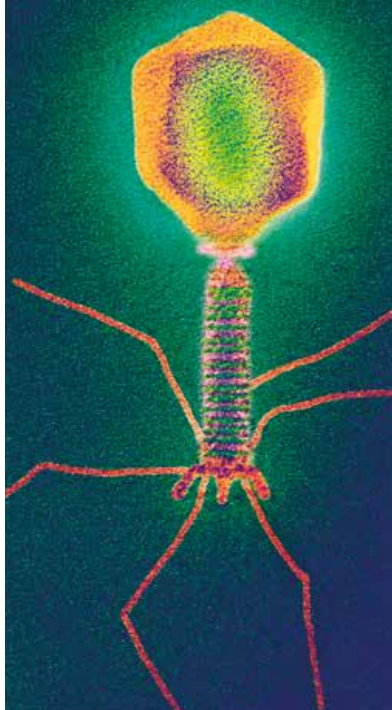


## Can bacteria contract viruses of their own?

Lucas Smith, Midrand

**O**h yes. Bacteria can be infected by so-called bacteriophages ('bacteria eaters'), which are

essentially bacterial viruses. They consist of an angular head attached to a type of grappling hook. It looks surprisingly like the grappling hooks we're used to seeing in those little glass gambling machines to win a teddy bear or watch. They use it to hook onto the bacterium and puncture it. Bacteriophages are about 0,2 micrometres (0,0002 millimetres) big, which is about 50 times smaller than the average bacterium. Just like viruses, there are many different bacteriophages. They all have different effects on the bacteria they infect. Some kill the bacteria directly after invasion by starting immediate cell renovations. Others sit quietly in a corner and wait for the bacteria to die before they become active.



Should I SMS him?  
Wait? Or just plain  
call him?

## Where does the so-called broken heart come from? Is it a figment of our imagination or is there something more behind it?

Karen de Jager, Vereeniging

**I**f you're suffering from heartbreak, there's very little wrong with your actual physical heart. But the pain you feel is very real. Scans show that people who are suffering from heartbreak have brain activity in the regions that are also active during physical pain. Research at the University of

Amsterdam indicates that heartbreak is very similar to post-traumatic stress syndrome (PTSS), a psychological illness that occurs in people who have experienced something particularly traumatic. Because, just like people with heartbreak, they suffer from irritability, sleepless nights and angry outbursts.

### Q&A **FLASH**

- At least one third of people with heart-break also have headaches.
- In 63% of people who suffer from heartbreak, it lasts for longer than a year.

## Were the Vikings really the brutes and plunderers they're made out to be?

Ben MacKenzie, Zandspruit

**V**ikings were renowned in the 9th century for their pillage. But were they any more violent than the rest of the Europeans at the time? Luit van der Tuuke, Viking expert and author of books on the Normans, believes the Scandinavians didn't particularly distinguish themselves from others in the era. "The farmers of the time actually had more to fear from roving bands of their own soldiers." So why did the Vikings become known as being particularly brutal? "Because they focused on rich targets. At the time, those were the churches and monasteries." The heathen Normans had no scruples about invading holy ground or murdering spiritual leaders. For them one lot of loot was pretty much like any other. But Christian historians were outraged – and they

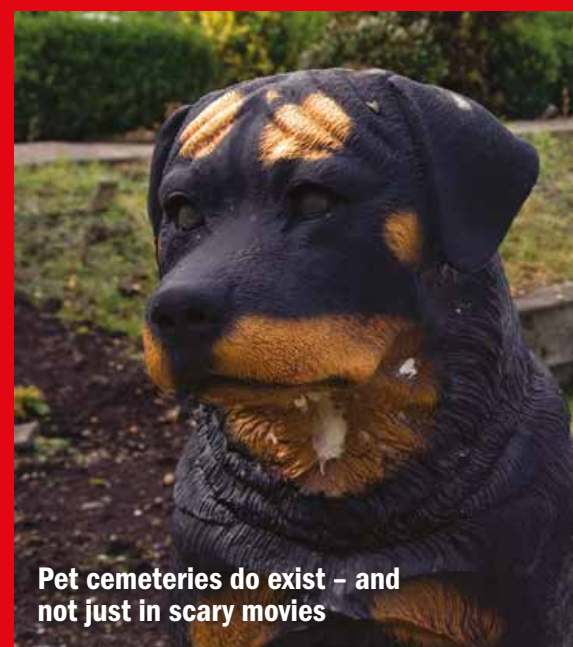
were the ones writing the histories. Our main sources of information about the Vikings are therefore hardly objective in their portrayal of these 'brutes'.



## What does the vet do with the bodies of dead pets?

Vanessa Slabbert, Wilgeheuwel

**Y**ou can have your pet collected from the vet and brought to a pet cemetery. If you have a garden, you could possibly also bury your pet there (it depends on your municipality, so ask them about local by-laws). Or you can ask for your dog or cat to be cremated. In that case you'll receive the ashes back in an urn or wooden box to take home with you. Or have the ashes compressed into a gem. Not your style? Then the body will be collected from the vet by a biohazard removal company and incinerated along with other dead animals and animal by-products from meat production.



Pet cemeteries do exist – and not just in scary movies





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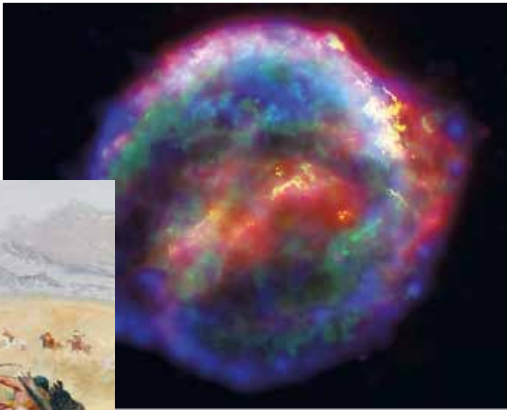


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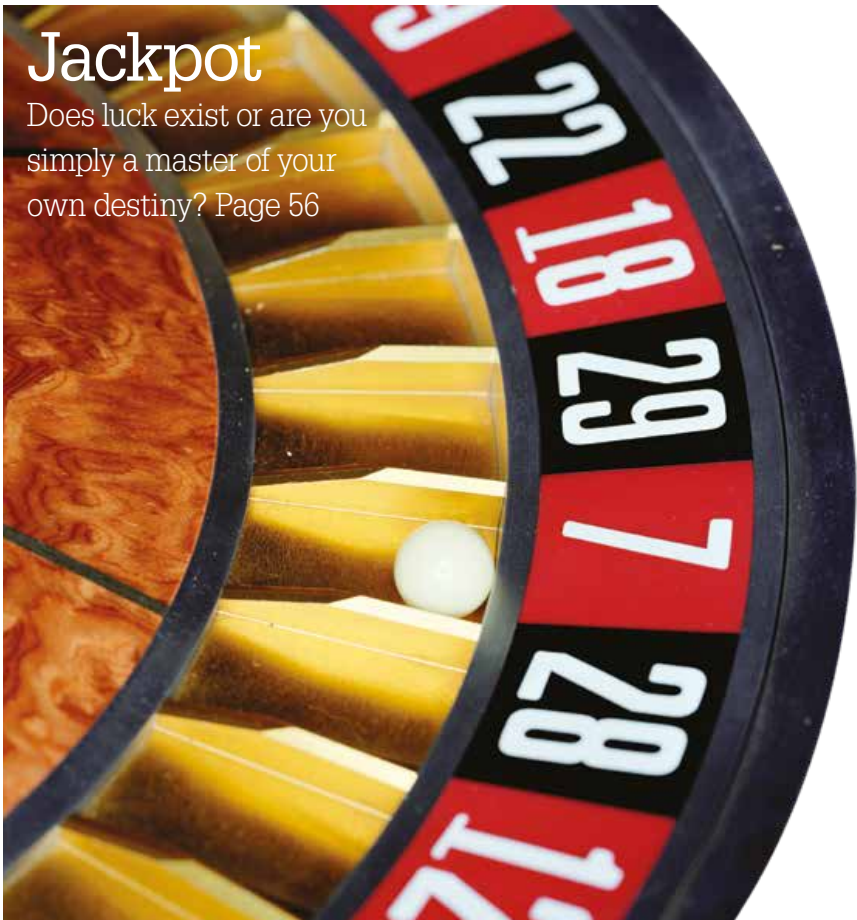


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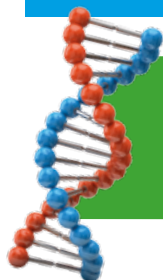
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